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Editorial

An all-out campaign for increased rice production in the country

It is common knowledge that the average acre yields in India are very far behind those countries in the East, like Japan and China or of the West, like Spain, Italy and United States of America. One of the essential features which differentiates rice growing in this country and that in the others is the period during which the bulk rice crops are grown in several countries. In the Indian Union most of the rice is monsoon crop, when high humidity and comparatively less sun-shine favourable for promoting vegetative vigour at the expense of grain formation are present. In all the other countries which record very high acre yields, rice is an autumn crop It is grown from May to September when ideal conditions prevail for maximum out-turn. The soil and atmospheric temperature, humidity and sun-shine are optimum. The irrigation is also heavy notwithstanding good uniform rainfall available in those countries. It is no wonder, therefore, that high acre yields of rice result. In Madras where rice is grown as an autumn crop high yields comparable to those in Japan are obtained. This should not, however mean that we in India cannot improve our acre yields. Though not to the same extent as in Japan just now, our rice yields can be quite easily stepped up by pooling all the natural resources of the country and adopting better cultural methods, to enhance the present average by at least another 50 per cent more. By research high yielding strains of rice have been produced. The experiences gained on the optimum use of manures and the adoption of the best cultural practices and other useful information for increasing rice production have not reached all the cultivators in proper perspective due to diverse causes.

If it should be possible to take this knowledge to as many rice cultivators as possible, the total rice production in this country is bound to increase. The Government of India have realised that the above objective can not be achieved unless a compaign on the mass scale is launched to bring home to the cultivator the good points in rice cultivation. They have accordingly inaugurated what is called, "The campaign for the Japanese Method of cultivation" on the 15th March. It is significant that this improved method of rice culture is called the Japanese method of rice culture. The JAPANESE are noted for their tenacity of purpose. Love for work and service for their nation even at personal sacrifice are their motto. Adapting

the conditions to crops and the crops to changing conditions are planned and practised to obtain the best from the available resources. Their soil is made to do its full duty through the available growing season. Emphasising the essential features of the Japanese method or for the matter of that, the improved rice culture which the Campaign is intended to foster amongst the rice cultivators of the Indian Union, it consists essentially in the raising of healthy seedlings with the saving in seed, transplanting seedlings in a regular way to permit of thorough weeding and interculture and practice of a judicial combination of natural manures like compost, green manures etc., and chemical fertilizers, namely amonium sulphate and super phosphate. The seed used should be sound, for, bad seed or inferior seed is anathema to the Japanese and therefore it cannot produce good progeny and a good stand of crop The seedling must have a good start in life. so that it can make the best use of the added fertilizers. The transplant crop should have no competitors in weeds infesting the fields and requires adequate doses of plant foods during their growth. All these are properly attended to in the Japanese culture. The notable feature in this method of cultivation is that it involves no complicated processes, no expensive implements and yet increased yields are obtained by the simple use of improved seed, proper planting and judicial use of manures. The Government of India in co-operation with the States have planned a nation wide Campaign through radio, schools, teachers and all other possible media to take this information of good cultivation of rice to as many villages as possible.

It has been found that a judicious use of amonium sulphate with organic manures is useful for immediately increasing rice yields in many parts of the country. The Government of India have announced a reduction of about Rs. 70/- per ton in the issue price of amonium sulphate. Arrangements have been made to stock the manure at suitable places for the use of ryots. Adequate quantities of rice seed are also available at suitable centres for the benefit of ryots. It must, however, be noted that the best results are obtained by the use of green manures. Sesbania speciosa which withstands drought, flooding and is free from pests and produces a good tonnage of green matter is veritably a marvellous green manure crop which can be planted in the fringes of paddy bunds along with rice and in four and a half months' time, yields 3000 to 4000 lb. green matter to serve as basal dressing for rice manuring. A vigorous campaign is also made by the State Department independently for the extended use of this valuable green manure crop. It is fervently hoped that with the inauguration of this nation-wide campaign for better farming practices in rice culture, the food deficits of the State from rice out-turn will dwindle in the years to come.

Maximisation of Seed Production in Improved Strains and of Plants in Improved or Superior Varieties*

By

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In a printed note prepared by the Indian Council of Agricultural Research for the Eighth Meeting of the Crops and Soils wing of the Board of Agriculture and Animal Husbandry in India it was explained with the aid of available statistics that the average yie ds of the major food crops in India were practical'y the lowest in the world and that the yields were progressively declining from year to year. In another note from the same source circulated on the same occasion it was stated that pure seed was the first requisite for good cultivation, though it was seldom that the farmers sowed pure seeds. On the other hand, crop survey reports from U. S. A. speak of the achievements in crop breeding having more than offset the declining fertility in continually cropped soils such that the farmers have been enabled to maintain average yields despite the increased damage by pests and diseases.

None can deny that in this country too crop breeding has had its due laurels. A spread of about 95% by improved sugarcane varieties is a measure of advance that can stand comparison with the best in any land. It is at once a tribute to the magnificent achievements of the breeder, as to that of officials and non-official agencies who had taken upon themselves the task of popularisation of these varieties. Incidentally, it is an index of the readiness of the farmers to take to a new crop or variety, whose advantages are convincingly brought home to them.

In other agricultural crops too, the estimates of area covered by improved varieties or strains is fair to substantial ranging from 10 in oil seeds to 50 in cotton. The crop sampling surveys have indicated that during 1948—'49 about 39% of the area under rice in this State was under improved strains and this contributed about 30% increased yield over the cultivator's bulk**. Even if the increase is less than half of the above, we can safely infer that a complete coverage by pure seeds of improved strains of our food crops would wipe out the State's food deficit.

Under the present set up, we have, broadly speaking, three classes of farmers—the largest majority who either do not believe in pure seeds of improved strains or have not heard of them, the second group who are the most progressive and are ever keen to use these seeds, while the third forming an uninterested and indifferent class who use good seed

**Balasubramanyam, R. The part played by improved seeds in the maximisation of crop production. Madras Agricultural Journal Feb. '51.

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only when they get it. Our seed multiplication and distribution organisations and methods shall have to tackle all these three classes of persons, if the maximum improvement through the use of good seeds is to be obtained.

It is doubtful if all the seeds used by the name of pure seeds of improved strains, are entitled to be classed as such. So long as we have no Seed Act with Seed Testing Stations and a Seed Inspectorate, there can be no guarantee to the purity of seed and consequently to the performance of the crop raised therefrom. The Central Tobacco Research Station, Rajahmundry conducted an interesting test for three years with seeds of so-called superior tobacco strains of H. S. 9 that were being sold to the growers by different agencies and came to the surprising inference that there was no difference between them. In other words, all the so-called improved strains were found to be as effective and no better than the local Harrisons Special. It is yet to be found out as to how many of our so-called improved strains of other crops have deteriorated or have become ineffective with the lapse of time. Even if our nucleus seed is above reproach, the extent of impurity in the inner and outer farm seed is bound to vary, depending upon the care bestowed by the seed farm ryot. There may also be innumerable farmers who preserve their own seed, not depending upon the seed farm produce, and in whose case too, the purity may range very greatly. The tendency of many strains to run out as a consequence of the genetic and cytological make up or peculiarities, may further accentuate the problem, rendering the so-called pure seed of improved strains progressively ineffective. Until we are in a position to ensure the purity grade of an improved strain, we have to be prepared to meet with a decline in crop production in proportion to the seed impurity that only gets accentuated in geometrical proportions with every successive sowings. Many crops are also prone to cross-fertilisation to a more or less extent and thus give rise to mixtures of heterozygous individuals. Unless exploitation of natural cross-pollination for hybrid vigour is done in these crops, as in our Hybrid Cumbu Scheme, there is no chance of securing an appreciable increase in crop yields by the normal methods of seed multiplication and distribution to which we have been accustomed. But hybrid vigour is not a programme worth exploitation in all crops. Where it is not, we have to devise methods to see that the process of running out is effectively checked in time and the growers have a recurring source of good and pure seed. The practice of replenishing the seed every fourth year is an ideal practice, but has not been followed in all places and by all growers, owing to obvious difficulties in securing the replenishing stock of the right degree.

In perennial, seed propagated crops the position is even less certain and satisfactory. In coconuts and arecanuts for instance, our

existing methods of seednut selection is based purely on the observed characteristics of only the female parent. It is not known if the better size and appearance of the seedlings from the selected seednuts are due to parental selection or due to the roguing out of the undesirable or weak variants in the seed and nursery buds. The strongest plea in favour of the present method of selection is perhaps found in a recent article by Prof. Cramer of Dutch East Indies. Even he could only lay the claim that "Many Seedlings of high yielding original mother trees have shown themselves good yielders."** In other words, all seedlings do not inherit the parental characteristics, and one should therefore be prepared also to get at times many seedlings of low yielding capacity, quite unlike the selected parent. Our seed multiplication and distribution programmes in respect of these crops, cannot therefore be deemed as perfect.

With a sexually propagated crops too, the position is by no means satisfactory. In the absence of a plant certification agency, the virtue or excellence of the plant material rests now certainly on the word of the nurserymen, with no risk whatsoever of his being legally questioned, even after the plant is found later to be spurious or quite different from that indented and paid for.

A rational and scientific seed, and plant selection programme is therefore as much the prime need of the hour as a dynamic and comprehensive programme to popularise the pure seed and plant material of the improved and superior strains and varieties. It is for Science to test and evolve sound plant and seed selection methods and multiplication. In any such method there should be provision to determine the stage when a strain should be withdrawn, as a result of the periodic check on the process of its running out under natural conditions or when its pronounced susceptibility to any pest or disease is detected. There should be also a device to decide upon the stage when the distribution of seeds should stop in favour of a different procedure or of a repetition of the existing procedure with freshly replenished seed stock. In the case of virus free Great Scot potato seed, remarkable yield increases are believed possible in this State, when the foundation seed stock is replenished annually. Our present seed development programmes are largely built up on the assumption that the strain maintains its pristine efficiency undiminished under a wide set of conditions, provided adequate roguing, cleaning, drying and storage precautions are undertaken. This will not happen when virus infestation is common. The percentage efficiency of the strain in each tract is, therefore, of utmost importance and this has to be determined after a definite interval, so long as the seed distribution programme is proceeding in respect of that strain.

** On the authority of citation by the Director, Central Coconut Station, Kasaragode.

There are different methods of ensuring purity and quality of seeds which have been adopted in different countries of the world. In Sweden for instance the Research Station's responsibility mainly ceases after the evolution of the strains or varieties has been effected, whereupon the multiplication of seeds and distribution are entrusted to a Company known as General Swedish Seed Company which has the monopoly to the products produced by the Plant Breeding Institute. The Government reserves the right to appoint some members of the Board of the Seed Company. The multiplication of the improved varieties of strains is done on farms belonging to the Company but under the supervision of the State Technical Staff. Later, there is provision for periodic inspection of the farmer's field which is linked also to the State General Seed Testing Station maintained by the Government. Thus the responsibility for multiplication and distribution of seeds is primarily in the hands of non-official agency, though subject to supervision by the Officers of the Government*

The East Punjab Government have recently passed an Improved Seed and Seedlings Act which aims (1) to compel every cultivator to use only the improved seeds or seedlings listed by the Agricultural Department and (2) to control and regulate the movements of improved seeds or seedlings from one area to another. The seeds or seedlings are made available by the Department of Agriculture through its authorised agents, whose activities are subject to inspection by Officers of the Agricultural Department. Similar enforcements have also been resorted to in many other countries as well, though in different forms.

Under the existing circumstances, it appears to be very premature to adopt in this State either the Swedish method or the compulsory system as that contemplated in the East Punjab Act in *toto*. Our Seed multiplication and distribution methods are not by any means standardised or developed to an extent as to meet the full requirements of the cultivators in all parts of the State. Unless we are in a position to cover the entire state with our improved seeds and unless we are in a position again to enforce the use of the improved seeds by every ryot, any certification of seed or legislative enactment can only be partial in scope and largely infructuous.

To most of our cultivators, compulsion is naturally repugnant. It is on this principle that we largely depend upon persuation and propaganda to achieve our objective of spreading our improvements.

Above all, certification or legislative action will involve an organisation to inspect the seed production and distribution, along with provision for testing the purity and quality at different stages. This implies a great

* Original publication not traceable.

deal of expenditure to Government, which sum has to be added on to the cost of seed. Thus, in the ultimate analysis the cost of seed is bound to get increased, which fact may hamper the spread of improved seeds rather than help us in our objective of covering the maximum area under improved seeds.

On all these considerations, it seems reasonable to infer that the seed certification programme cannot be introduced at the present stage of our progress. The experience which the Madras State Government has in regard to the Agricultural Bill is a pointer that such measures are unlikely to appeal to our representatives in the Legislature.

It is not the Government alone who are engaged in or are concerned with the seed and plant production and distribution programmes. Thousands of farmers, landlords, seedsmen and nurserymen, some large companies in respect of tobacco seeds and sugarcane setts, are also interested or are actively engaged in this line. Each crop has its own peculiar aspects, which dictate differential remedies. In the case of fruits, a Bill to regulate private nurserymen is already under consideration. For potato, a seed certification programme on an All-India basis has been conceived For sugarcane a varietal schedule and seed multiplication programme is being considered on a factory area basis. In the case of cumbu, the seed production programme is hinged around the methods for exploitation of heterosis. Some of the commodity committees are also having their distinctive seed multiplication programmes and methods in collaboration with State Governments. such as Indian Central Coconut Committee, Indian Central Tobacco Committee and Indian Central Arecanut Committee. The Indian Council of Agricultural Research too had evolved and worked upon a special scheme for vegetable seed production and supply during last Great War. All these show that a uniform plant for seed multiplication with a view to enhance the value or utility and to cover all the crops of a State or Union, is not possible.

Notwithstanding the foregoing limitations, it does seem both necessary and possible to formulate a seed development policy which would foster maximum coverage by seeds and plants of high purity and of tested merit So far as the plants are concerned, the question has been examined in all its bearings, and the Bill now under consideration by Government represents a device which would secure maximisation of plant production on sound and accepted lines. In the case of seeds, however, there are certain features in the Swedish System that can be copied with benefit to our State. In the undivided Punjab, wheat and cotton seed production was at one time mainly entrusted to large individual holdings such as those of the British Cotton Growing Corporation, Sri Joginder Singh's Farm, Convillepur Farm Etc., There is no reason, why private companies or co-operative agencies or large individual

land owners, including the Temple lands cannot enter actively to the seed production and supply business on purely commercial lines. If the exisiting lands are producing seeds at a certain margin of profit, it should be possible with a fixed premium to provide just that incentive as would enable certain companies, societies or individuals to produce the same seeds on a much larger scale, but on approved lines and to be delivered at the prevailing market rates plus the premium or subsidy. With the concentrated attention of the department on such seed production farms, the owners of these commercial seed farms will also have a better opportunity for securing increased crop yields at less cost and with less damage by pests or diseases. It should be possible to demarcate the zones for each strain or batches of strains in a crop and allot one zone to one or a selected group of companies or societies, so that the production of seed may be in tune with the requirments of that zone. It should be possible for one firm, society or individual to have within the concerned area of operation, strains of more than one crop. Under such clearly defined zones and crop or strain allocations, the task of the Agricultural Department to supply nucleus seed to check the roguing and to certify the purity or viability etc., will be rendered easy in operation. All this will depend on either the passing of Seed Act, according to which every grower will be compelled to grow only the certified seed or approved strains, or on the efficiency of our extension service backed by that of the seed production and supplying firms. As explained already, the latter may have to hold the field for some years to come, so far as this State is concerned.

Along with the fostering of these commercial seed production and distribution agencies with well defined crop or strain zones, there is the need to take crop sampling check for testing the efficiency of the strains from time to time, in addition to the routine inspections for checking purity, viability etc., It is only when all these measures are implemented, will the whole seed multiplication programme be stabilised on a rational and dynamic basis. When that is accomplished, our research organisations will be free to perform their legitimate function of evolving increasingly more efficient strains to suit every condition or purpose, instead of the prevalent system where their research is mixed up with all kinds of non-research duties, including seed multiplication activities, to the benefit of none of these different branches of activities, but to the possible detriment of all work.

A Note on the Methods of Maximising Production of Pedigree Rice Seed and its Distribution to the Cultivators*

By

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It is well recognised that successful plant breeding work by itself can improve the production of rice in this country by at least 10 per cent if the existing unselected varieties that are now being used by ryots are systematically replaced by improved strains by well planned seed multiplication and distribution schemes. Increases in production may be obtained by crop management as a short term programme, but in the management of a crop, the question of costs comes in and a certain treatment ceases to be useful if it is uneconomical. Growing an improved variety costs the cultivator no additional expenditure. No difficulty has been experienced anywhere about the cultivator being unwilling to take up an improved strain when once he is convinced of its superiority.

It has been found that differences up to 20 per cent exist between crops grown from 'elite' seed of a strain and seed of the strain that has deteriorated. Deterioration occurs when seed requirements of a particular region are too large to permit of a research station to exercise the necessary supervision at all the stages of seed production and multiplication. The primary functions of 'seed distribution schemes' are: (1) increased production, (2) increased value of the produce and (3) introduction of the better yielding strain into new areas. The full benefits of an improved strain are realised in proportion to the progress made in the above which are connected with the rapidity of its extension in the country and the maintenance of its purity.

Taking first the quick method of extension in the country an understanding of the methods followed in some countries and some of the other States of the Indian Union may be helpful to give an idea of practical aspects so that we might adopt such of those methods that are suited to our conditions.

Taking the case of cereals, in the U. S. A., the research stations produce enough seed to sow at least 1000 acres of the strain. This is given to a limited number of growers say 25 to 30, who are '*certified*' growers so that the crop may be kept in a state of high purity. The produce from this area furnishes the foundation for further rapid spread. From this stage the seed gets into commercial production and it is at this stage that there is the danger of admixture, which occurs in the several phases of the crop, threshing and storage operations. But it has been recognised that the responsibility of the Government does not cease with the mere development of superior strains, but also extends to the

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multiplication and maintenance of an assured supply of the strain to all those who want the same. There are private seedmen in every one of the several States, but the Government employs about 80 to 100 Extension Agronomists and a very large number of agents, who check the purity of the seed. Supervision is done in the '*field*' and the inspection in the '*sack*' by the Department which ensure a thorough check on the seed purity. These activities are financed through a small certification fee and sales tax on the sale price of the seed.

In Canada, one of the biggest Seed Unions in the world called "The Canadian Seed Growers' Association", a private organisation employs provincial officers for field inspection who certify the seed both after the '*field*' and '*sack*' inspection. This association grows nearly a million acres of wheat every year forming about 5 per cent of the total area and from the produce of this area the whole tract under wheat in Canada is covered.

The Seed Union at Svalof, which has also its own Research Station works on similar lines in the case of most of the cereals. In Australia, the Government departments deal directly with the farmers. A list of growers of pure seed is published in the Agricultural Gazette. The list is compiled after inspection of the standing crop and also the seed in the bin or sack. In Japan, before the war, seed distribution was so thoroughly organised that any but the use of certified seed was considered illegal. Pedigree seeds were made available in very many godowns in requisite quantities at reasonable rates through the Government agencies and in some places through private organisations such as Better Farming Societies, Village Seed Associations, etc.

In Burma, before the war, besides the departmental farms, a large number of seed farms were doing this work. The 'major' seed farms are owned by Government and situated at the head-quarters of the district and equipped with adequate buildings etc., for storing the produce. There were 24 such farms in 1939 – '40 with a total area of 2800 acres. Scattered round about each of these major seed farms are the minor ones These were usually Government porambokes reclaimed and leased out to tenants on certain conditions and usually they got special concessions by way of subsidies of seed, manures, etc. These minor farms, 153 of which occupied 9500 acres in 1939 – '40 are inspected thoroughly by the State and the whole produce is bought by Government and sold to people. There are also a number of private organisations to which seeds are first distributed from the minor seed farms who maintain registers showing the names of those to whom the seed is distributed. The total seed thus distributed is reckoned to be sufficient for nearly one million acres every year.

A similar procedure as above is said to be in vogue in the Punjab with regard to wheat. In Bengal, when one improved strain was first

intended to be quickly multiplied, 10 lb. packets of improved seed were distributed the first year free to 12,000 people. It immediately struck root and further purity, etc., was maintained through seed farm at central places in each district which also had two or three registered Seed Growers. These are under the direct supervision of staff of Government.

The District Village Improvement Committees of Bombay, who run seed farms and the registered Seed Unions of the Central Provinces supervised by the Government, where each member deposits a part of his produce at the time of harvest, may be of some interest to us in Madras. There were 23,000 such private seed farms in the Central Province in 1938 – '39 and twelve million pounds of paddy seed sufficient for three lakhs of acres were sold by them, excluding wheat, sugarcane, etc. In Sind, there are permanent registered departmental rice-seed growers in each thana or district.

In regard to the actual method of distribution and sale, there are variations from country to country and province to province. In the U. S. A. the cost of certified "pedigree" seed is usually much higher than the produce for consumption. The growers do not mind this extra cost and there is actually a rush for the seed, because they are convinced of its definite superiority over the local seed. This is achieved through a very strict control in the several stages of crop growth and the produce, followed by certification. In Bombay and also in Sind as in the Dhan Prabhundakaran Sabhas, seed from the seed farms was being distributed on exchange basis in most of the cases, the small differences in price being written off. In Bengal and United Provinces the 'Sawai' system the grower obtaining the seed from the Government godowns and returning the quantity at harvest time with 25 per cent more, was in vogue and the ryots contract to sell, if required to the Government, upto three times the quantity they have taken. In the Punjab, the sale of departmental seed is in the hands of non-official commission agents, who get usually a commission of two annas to three annas per maund of seed and the distribution is checked up by the departmental officers. When the seed farms are run by the Co-operative Societies, sales to non-members are usually charged 10 per cent extra.

In the case of paddy crop, where the rate of multiplication may be quick enough, a forty-fold multiplication is possible each year. Thus supposing an area of 10,000 acres is to be covered, the scheme of work will be :—

1st year from nucleus seed from the station = 6 acres (of primary seed)

2nd year from the above primary seed, secondary seed farms which may be certified, if necessary } = 240 acres

3rd year – seed purchased by the Department and distributed to ryots } = 9,600 or 10,000 acres

This unit can be taken as the basis for operating the seed distribution scheme. Work on this scale requires an efficient supervising staff, provision of facilities for drying and storage and possibly some working contingent expenditure for paying roguing charges, premium to the cultivators for production of good seed etc. It may not be difficult to persuade the ryots to pay even 25 per cent more for seed which would satisfy the standard of that produced in a research station and though it may be necessary to finance this scheme in beginning of the season, this is recoverable after sale of the seed. There may be some difference between receipts and expenditure but considering the easy and sure way of increasing the total production, this money should be found by the State Treasuries.

Seed production even in the most advanced countries as can be seen from the above, is still in the hands of the Governmental agency or departments with adquate supervision at each and every stage. If private seed agents are encouraged, a form of certification may be necessary. Financial regulation may have to be slightly relaxed to permit maximum turn-over. Co-operative organisations wherever feasible, may be encouraged to take up the distribution of seed. The price of seed should be at a higher rate (but not very high) so that there may not be misuse, but the quality of the seed produced must reach a high standard to attract the farmer. For the poorer sections of cultivators, the seed may be given in exchange if necessary, with a small percentage of extra seed to be collected at harvest time. Police thanas and village chavadis may be utilised for seed distribution to small ryots. A system of seed distribution at a fixed price like the selling of quinine at Post Offices, during the sowing season may be useful for smaller ryots when a new strain has to be quickly substituted. Takkavi loans should be given freely to taluk associations and the like, stipulating their seed requirements will be purchased from approved seed growers, while seed lent to small agriculturists on loan may be made recoverable in kind at harvest plus a reasonable rate of interest in kind. Better Farming Societies may be encouraged to be established and improved types grown for seed purposes and inspection is to be freely given by the Agricultural Departmental Officers. Blocks of cultivable wastes may be given free of assessment with some sort of subsidy to persons who undertake to grow approved Departmental strains. The establishment of large pedigree seed farms managed by private individuals but controlled and supervised by the Department must be encourged. Hand bills, pamphlets, posters and local dailies may be made use of to publish availability of improved types at particular centres well in advance of the sowing season.

Pedigree Rice Seed and its Distribution

It is sometimes pointed out by the cultivator that the original standard of an improved strain with regard to yield or other attributes deteriorates with lapse of time.

Though experimental proof is not available, it is possible that in quantitative characters, such as yield, controlled by a large number of genes there may be small mutations and such mutations when they are retrograde might cause deterioration. The existence of physiological forms in disease-causing organisms is responsible for some disease resistant strains to lose their resistance to a particular disease after a lapse of time. Where the strains are of hybrid origin it cannot be said that the strains are really homozygous for all the quantitative characters and it is possible that the residuum of impurity present would get increased in subsequent years. Non genetic causes such as the inadvertant mechanical mixture with other low yielding varieties at different stages of the crop growth, non-adaptability to climate and soil conditions and exhaustion of the soil in the absence of suitable manuring may all cause deterioration.

A nucleus has to be always maintained on the breeding stations to form the primary source for seed multiplication. The best way of doing this is to make secondary selections, even from the improved strain at periodical intervals, say once in five or six years, if possible, under replication. Those progenies which are representative and are high yielding and do not show variability can be bulked up, and this made to form the nucleus for further multiplication.

To get the maximum efficiency out of the use of improved strains and to prevent slipping back of the yields, the cultivator would also be changing his seed every five or six years. To keep up a continuous flow of supply of 'elite' pure seed, it is therefore essential that there must be an organisation to produce the seed in sufficient quantitities as before said. Thus in the improvement of a crop, the joint efforts of the scientists and the producers are essential. Without the active co-operation of the producer, not much progress can be achieved. Good seed must not only be viable seed, but it must be fixed in type and should be adapted to the locality combined with high yield.

A few practical hints to farmer friends can be summed up as follows: (1) Select in the field, take good plants, discard light grain, save this seed; (2) grow this seed in the seed plot, the most fertile of your fields, as good seed cannot be produced on bad land and (3) Select every year and step up production for all-round plenty and prosperity.

Methods to be Adopted to Maximise Production and Development of Improved Strains and Plant Materials — Coconut and Oilseeds *

By

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1. **The necessity to maximise production:** There is an immediate necessity to increase the production of not only the food and clothing crops but also money and industrial crops. Considering the food crops, emphasis has to be laid primarily on the staple food crops of the region and then on the subsidary food crops to supplement the main crop. Population has been increasing at a rather rapid rate and large quantities of food grains are being imported from foreign countries and therefore foreign exchange and dollars not only to pay for the imported goods but also for the capital goods required to grow more food schemes and for industries, should be found. Therefore the cultivation of money and dollar earning crops like groundnut, pepper tobacco etc. should not be neglected.

2. **Methods to be adopted to maximise production:** The freedom to produce more implies that the necessary facilities should be forthcoming and steps have to be taken to bring into cultivation marginal lands. All and every known method for stepping up production should be made use of judiciously and economically from preparing the soil manuring, sowing, irrigation, control of weeds, harvest, storing and disposal of produce and treatment against pests and diseases. The use of labour saving implements and machinery should be pressed into service. Talking of manures and manuring the necessity of applying adequate quantity of nitrogen to poor soils is of primary importance. The use of green leaf, green manures and composts is stressed. The long, neglected use of human urine, if not night soil, has to be seriously considered and advocated as in China, Japan and other countries. Another subject which has not received the attention it deserves is seed testing, and there is urgent and immediate necessity for a separate seed-testing wing of the Department. The greatest and the most serious limitation of increased production of food and commercial crops, is water. In fact water when and where it is required in adequate quantities is the immediate solution of our problem. Every available source of water-rivers, wells, tanks (storing rain water) should be fully utilized. No water from any source should be wasted or allowed to run off to the sea. Flood water has to be controlled. In this emergency of more production, the problem is primarily that of the hydraulic (water conveying)

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Engineer. He should be given the top most priority in achieving the objective. The latest and the best methods and instruments have to be adopted. Water-divining not only by means of the machine but also by the rod has to be fully made use of in locating water sources.

3. The Development of improved strains and plant materials: (i) *General:* Of the various methods that can be advocated to step up production that by improved seed or planting materials is of utmost practical importance. Good seed is a primary pre-requisite of a good crop. Every Specialist practically in every crop has a number of improved strains of quality which have done well in the different zones of the state and which are capable of yielding about 10—30% more than the local. This would mean that if all the local seeds which the ryot sows or plants can be replaced by the improved or Departmental strains, the production can go up by about 10–30 % which is no mean achievement. After all our deficiency is only about 10%. Though there is considerable demand for the Departmental strains and though the crop Specialists have been supplying nucleus seed of improved strains to the District staff during the last several years, the progress made, in general, in replacing the local seed has been slow and much remains to be done. This is because the brunt of the work falls to the share of the Department and there is no private agency to take up the multiplication and distribution of improved strains. This is because proper inducement by way of bonus as in foreign countries etc., is wanting. And in the Department itself the organisation to multiply the nucleus seed given by a specialist, by the District staff does not seem to be effective for various reasons. Now some specialists are operating seed multiplication schemes up to the primary or secondary seed farm stages and further development is passed on to the District Officers. Though this method ensures greater production of improved seeds for sowing in the early stages, the want of continuity of the work by the same staff tells on the results. The seed multiplication work properly belongs to the extension wing and may be carried out right through from the beginning by the extension wing the nucleus seed, the technical help and guidance being provided by the specialist concerned. Though each crop has its special problems to be solved in the multiplication and distribution of the improved seeds, the constitution of a special wing of the Department soley for this purpose is expected to solve the problem. All crops will have to be handled by the wing and the staff should be thoroughly trained in handling the different crops. Or if it is considered necessary that the specialist himself should take up the seed multiplication of the improved strains evolved by him even up to the tertiary and later stages he should be given the facilities of the required land and staff in the various zones of the state.

(ii) *Oilseed Crops:* (As there are other papers on oilseeds giving details it is not proposed to get into greater details here still.) A few

points which should be considered in the context of seed multiplication of improved oilseed strains are presented.

1. **Groundnut:** The seed rate is high and the rate of multiplication is low. It will be therefore necessary to provide large seed farms, about 50 acres, in the primary stages so as to get more seed to start with.

2. **Gingelly:** The seed rate is low and the rate of multiplication is high. As the crop is season and tract bound it will be necessary to organize nucleus seed farms in more tracts than is required for groundnut or other crops. The one at Tindivanam station cannot meet the needs of the different tracts of the State.

3. **Castor:** This is a highly cross polinated crop and with a view to maintaining the purity of the strain, it will be necessary to try only one strain at a particular centre or provide sufficient distance between the blocks of different strains.

4. **Coconut:** There is considerable demand for the Madras material not only in the State but also from the adjoining states and elsewhere, and the number of nurseries should be increased. The seed nuts and seedlings should be very carefully and scrupulously selected. Though there are nine coconut nurseries already functioning in the State with a target of 1,60,000 seedlings, there is need for more nurseries.

OBITUARY

The Madras Agricultural Students' Union has lost one of its senior members in the death of Sri C. S. Seshagiri Iyer. It is sad to record that he had his sudden end due to heart failure. The sympathies of the Union are for the members of the bereaved family.

May the Soul rest in Peace!

Methods to be adopted to Maximise Production and Development of Improved Strains and Plant Materials — the Part Entomologist can Play *

By

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Government Entomologist

It appears peculiar that an Entomologist should be asked to contribute a paper on the above subject. He has no method to be adopted for production and development of improved plant materials. He cannot also make any direct contribution for maximising crop production except when bee colonies can be utilised to increase yields and the only part he can probably play is to check the minimisation of production due to pests. It is in this that the Entomologist can be admitted to have his say in the subject chosen for the symposium at this Conference.

For my purpose the title reduces itself to one of safe-guarding Improved Strains and Plant Materials while in the process of maximisation of their productions. Insects are not respectors of materials produced with varied scientific talents. They do not make any difference between an improved strain or plant material and their local cousins unless the material evolved is so designed either to avoid them, resist them or even tolerate them. Evolution of insect – resistant varieties of plants though not directly concerning an Entomologist, will form a line in which he may be expected to play some part. The work will consist in the discoveries of varieties or strains of plants which display high resistance to insect attack and exploitation of the discriminative capacity on the part of the insects to select one variety in the preference to another. Apple varieties resistant to the woolly aphis (Eriosoma lanigera) and cotton varieties resistant to jassid and a few other similar instances are often claimed to have been evolved with varying degrees of success but absolute and perpetual resistance in any case remains only an ideal. Leaving aside this scientific achievement as of occurrence only in a few cases, the subject to be dealt with is nothing more than Plant Protection in Entomology if the garb is removed and pointedly examined, special importance being given to preservation of nucleus stocks of grains or plant materials produced as distinct improvements over the locals. In a country where agriculture is the main profession of the majority of inhabitants there will exist some local practices for the control of pests that damage crops. It is quite necessary to have a comprehensive view of these indigenous efforts to see in what all directions and to what extent it had developed and what more is to be done with the latest methods

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available. The survey of indigenous methods shows that a fair use was being made of mechanical methods like hand-picking, basketting, pruning and digging out burrows etc. As we dive deep into this subject of agricultural practices and their bearing on the avoidance of insect pests, one cannot but admire the South Indian cultivator. The chemical method was practically confined to the use of arsenic as stomach poisons against rodents and Acorus and Tobacco as contact poisons. There existed a fair knowledge in the use of deterrents like camphor, copper sulphate, asafoetida, garlic, neem oil cake and leaves, tobacco, ash, lime, kerosene, tar and leaves with strong aroma like Ocimum, Gynandropsis etc. There were no effective fumigants in use and the biological control was confined to use of perches for birds, and driving in of ducks in Spodoptera – infested fields to clear them In grain storage, maximum use was made of sun-drying and pitting of produce for curing and avoiding insect and fire hazards.

It is with the above background, that Economic Entomology had its birth in this State in 1912. During the first decade, considerable pioneer work was done in establishing Entomology as Science and careful systematic study of insects in general and economic plant associates in particular. Till the year 1943, efforts towards creating an economic turn for Entomology yielded limited results in popularising mechanical measures for cutworms, hairy caterpillars and other pests, use of arsenates against tobacco and brinjal pests, tobacco decoction and Fish Oil Rosin Soap against soft bodied sucking insects etc. Biological control against the coconut caterpillar (Nephantis serinopa), the fluted scale (Icerya purchasi) and the woolly aphid (Eriosoma lanigera) in the Hills was also well established. It was in the year 1943 that fumigation method was brought into large scale use for treating infested foodgrains and this formed the first land mark in our progress towards effective and large scale application of pesticides.

It can be said that the introduction of BHC (Benzene hexachloride), DDT (Dichloro-diphenyl trichloroethane) and Zinc phosphide into the State for large scale uses almost synchronised with the starting of the Plant Protection Scheme and since then the Entomological activities of the State Department have proved really useful and economical to the toiling peasantry and won recognition from the public. We have now effective remedies for most of the pests and it is only the internal feeders, the coccid group and some of the hairy caterpillars that are still defying us. The Entomologist had to replace most of his old and ineffective stomach and contact insecticides and take to chemicals of complex nature with varying action on insects of even the same type of mouth parts. There is combination of actions of a stomach poison, contact poison, deterrent and even a fumigant sometimes in these pesticides and the chemical control had to be reorientated and adjusted with these drugs of great potency, now synthesised and available for ready sales at fairly

cheap cost. These drugs, however, did not prove to be an unmixed blessing and brought in their train the problems of phytocidal action, toxicity hazards and adverse effects on predators and parasites. The task of the Entomologist has thus been rendered highly technical and difficult as he has to make a judicious use of these drugs and adjust their dosage, bearing in mind their selective action and also their adverse effects mentioned above.

While we are consolidating our position with the wonderful drugs like BHC, DDT and Zinc phosphide, we have now reached a stage of further elaborating our efforts with purified BHC, HETP, Chlordane, Toxaphene, Parathion and Systemic insecticides like Schradan, Pestox etc. The purified BHC, known as Lindane and Hortex is devoid of the adverse effect of BHC in imparting bitter taste and flavour to vegetables and fruits and the phytocidal action against some plants. HETP is effective against both plant lice and mites and can be used as a combined spray when both exist. Since it has little lasting effct it can be used for tobacco and vegetables and fruits in bearing to avoid the residual effect in the harvested product. Parathion has proved to be the best insecticide for coccids (scales and mealy bugs) but on account of the toxicity hazard, has to be handled with care and only under conditions where absorption and retention by the harvested produce cannot be questioned. The systemic insecticides have given very encouraging results against plant lice, mites Penatatomid bugs, Tingids and certain coccids. As direct spray, these insecticides dot act on the insects but the active principle in them is absorbed by the plant, taken into sap and turned against insects that feed on the sap. Quite strangely the leaf eating insects that feed on the plants sprayed are not affected. The advantage in the use of systemic insecticides are (i) They are very efficient against some sap sucking insects and can act against them all when they are together. Hence the occurrence of plant lice and mites in company, which is common, can be dealt with together in a single treatment. (ii) Lasting effect continuous over a month and this is a great advantage as the plants treated can not only be freed of the pest existing at the time of spraying, but even helped to risist it over the coming four weeks, which is generally the period of occurrence for insects in a regular pest condition. (iii) These systemic insecticides do not affect the predators and parasites of pests and consequently their use does not at all interfere with the "balance of life", nature is always attempting to maintain and the "enemy" factor is not interefered with. (iv) Even a light spray on the plant is enough and careful spraying to cover the pest or the plant is not necessary. This secures a provision against careless work at spraying by the labour engaged. These insecticides are however, to be handled with care and crops sprayed can be harvested and used only after about six weeks after spraying. With these developments in synthetic insecticides the indigenous drugs like tobacco, Acorus, Thevetia, Lobelia, Tephrosia etc., are

not only unable to compete but even to establish as satisfactory popular remedies with ryots. Even tobacco which had established before as a common home-made contact poison is losing the ground now. Incidentally, the scope for the development of plant materials for control of insects thus appear to be limited to the extent indicated.

We have now many ways of storing grain free from insect damage. DDT, BHC or Paradichlorobenze are being used for seed storage. Surface dusting of bags with DDT or BHC can be freely done to keep off to a great extent insects infesting grain. Infested seeds excepting Oilseeds, can be fumigated with HCN (Hydrocyanic acid gas) and the grain that gets surface dusting of DDT or BHC or even fumigation with HCN can be used for human consumption. Zincphosphide baiting, if carefully and systematically undertaken, can eliminate rodent trouble in our stores. In spite of the availability of these wonder drugs, it will be an inexcusable matter if, in our present state of food shortage in South India, leakages are allowed to occur through agencies like insects and rodents. The latest methods of seed storage should be put to the maximum use in maximising production of improved strains.

Regarding storage of plant material, DDT can be used for storing of potato, sweet potato, turmeric etc. and special products like Geigy 33 – A. 5 – are available for the purpose. For materials that are to be used for seed purposes, there should be no objection to the use of such materials, leaving aside the controversy about DDT toxicity, as they contribute a good deal to prevent deterioration, while in store, of valuable materials under production. There is also advantage in fumigating and making seedlings and grafts pest-free before they are planted or supplied to the public. This prevents dissemination and transport of notorious pests and also helps the plant to have a healthy growth free from pests in its new life after transplantation. I may also add that it is better to get fumigated and certified all materials intended for local introductions or at least treat them with a fumigant as early as possible after their arrival. Plant introduction, if freed from their foreign pests and diseases, are sure to have particular enhanced value and use to the country.

The plant protection service has now taken to popularising pretreatment of seedlings like paddy, chilly, onion, tobacco, brinjal, etc. with BHC – wettable solution (for the first four) and DDT – wettable (for the last) either in the nursery before the plants are lifted or during time of planting and this precautionery measure has given encouraging results wherever it was used in warding off pests in the fields for a long time and securing healthy growth for the young transplants. This should be freely availed of in maxmising production of improved strains. I have also to add that what are not serious pests to grown up trees are sometimes serious to young plants. Under this category,

we have leaf eating insects like citrus caterpillars (Papilio sp), mango leaf weevil (Eugnamptus sp), scales and mealy bugs, mites etc. and they should be paid immediate attention and suitably dealt with as they otherwise interfere with the growth of young plants and even cause their death.

Lastly, the eradication of prickly pear by the Cochineal insect is still green in our memory and the use of insects to control weeds in planted crops as well as to clear the ground for planting of crops is another line through which the Entomologist can contribute for maximisation of production. To some extent, he can also help to increase production in crops and plants where the local honey bee can be pressed into service for effective pollination and consequent setting of flowers.

In conclusion, I wish to add that the maximisation of production of improved plants can be speeded up and helped by the Entomologists, if their units are allowed extended facilities, encouraged by further expansions and nourished to their full stature towards which the latest developments in Plant Protection can contribute not a little. May I appeal to the Public through this conference that the Entomologist has now changed his coat and in him you can find a contributor at maximisation of production, and a social worker who can make the humans and the cattle live more happily and that his services should be fully utilised?

Methods to be Adopted to Maximise Production and Development of Improved Strains and Plant Materials with Special Reference to Cotton — Statistics Gingely Forecast *

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From the point of Agriculture, maximum crop production is aimed by all the growers. Great attention is paid to increase the yields and attain the maximum by such agronomic practices like 'time of sowing', rotation etc; by evolution or introduction of high yieldings disease resisting varieties; by plant protection measures; br manuring; by bringing as much area as possible under irrigation; by the introduction of short duration high yielding varieties and trying to fit in the maximum number of crops in a calendar year; by enacting suitable legislation either to follow certain practices compulsorily or to prevent spread of disease or pests, or to discourage the multiplication of inferior or undesirable types to prevent malpractices etc.

In the present paper the authors propose to confine themselves to cotton crop of the Madras State, particularly from the extension point of view.

Cotton shortage in India: With the shortage of food crops created by the extension of hostilities to South East Asia in 1941, emergent measures were taken up to increase the internal food production of India under "Grow More Food Campaign". As a result of the above plan, legislation curtailing the area under cotton and executive orders controlling the prices of Indian cotton were promulgated. Other factors like closing of Japanese Market and competition of more remunerative cash crops like groundnuts, chillies and tobacco also stood in the way of cotton cultivation and as such both the area and production of this crop dwindled down rapidly from the pre-war levels in India as a whole. The situation was further aggravated with the erstwhile partition of the country in 1947, by which 33 lakhs of acres produceing nearly 16 lakhs of bales of long and medium stapled cotton was lost. The Indian Mills which required badly the above styles, therefore, suffered severely. By 1950, the number of mills in the Indian Union also steadily increased to 425 and in 1951 it was 445. The carryovers of both long and medium stapled cotton were rapidly consumed at an alarming level and a wide

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gap was created between supply and demand which was estimated at 20 lakhs of bales. This situation lead to part-time working or even to closure of mills. The Indian Union was therefore forced to depend upon other countries like Pakistan, Africa and U. S. A. for the supply of raw cotton to feed the mills and keep them working full time. Pakistan was not willing to part her cotton on favourable terms and complications also developed in foreign exchange. In the meanwhile the World cotton prices were also steadily mounting up. As such the Indian Union had to spend huge sums amounting to 90 crores of rupees to purchase her raw cotton. About 14 75 lakhs of bales of cotton are expected to be imported during 1951—'52 as against 8·31 lakhs of bales in 1950—'51. Hence ways and means for stepping up the internal production in a short period had to be devised and integrated with food and jute plans in order to avoid serious effects on the economy of the country and pressure on foreign exchange. Against such a background the Government of India launched the Cotton Extension Scheme on "All India Basis" from the year 1950 and allocating definite targets for each State in regard to both area and production.

State concessions offered to encourage cotton cultivation: All executive and legislative restrictions imposed by the States on cotton cultivation were removed. Farmers were assured that every possible facility to irrigate cotton crop would be given. The Government of India agreed to make good the loss in foodgrains arising out of the diversion of land from food to cotton by extra allotments. (This diversion of food crops was, however, given up during the third year of the scheme). Additional technical staff were appointed to advise on cotton cultivation. Full remmission of land revenue was offered to the increased area grown with cotton (This concession was however withdrawn during the end of the second year of the scheme). Loans were granted for the purchase of manures and seeds at subsidized rates and quotas of ammonium sulphate were exclusively set apart for cotton in all the States. The price structure of Indian cotton i. e. increase in ceiling price etc. were also revised and liberalised Cotton was permitted to be grown in tractor operated lands, under subsidy wells etc. and treated on par with food crops. Restrictions on movement were relaxed and priority for the movement of cotton lint to mills and seeds for sowing were sanctioned by the Railway Board and arrangements were also made regarding the allocation of coal and power to the mills, gin and presses.

Cotton position in Madras and survey of extension work done for the past two years: The area and production of raw cotton in Madras during the pre-war years of 1937—'38 stood at about 25·6 lakhs of acres and 5·0 lakhs of bales, respectively. As already pointed out due to the circumstances caused by the "Grow More Food Campaign" as a result of the extension of hostilities to South East Asia in 1941) and competition of more remunerative cash crops like groundnuts, chillies and tobacco, the

arear under cotton (which was in general relegated to the lands of low fertility) went down to 13·6 lakhs of acres during the partition year of 1947—'48 with a production of only 2·7 lakhs of bales. When the cotton Extension Scheme was launched in 1949—'50 the area and production stood at 16·91 lakhs of acres and 4·48 lakhs of bales. The demand by the mills was roughly estimated at about 7 lakhs of bales.

Unlike the other States of the Indian Union, in Madras, cotton is planted in all the months of the year in one part of the State or the other, being conditioned mainly by the seasonal rains at sowing and harvest or by availability of water for irrigation but not by limitations imposed by low temperature verging on frost as in North India. The major planting period in the State is, however, between August to November, if about twelve percent sown to kharif and two percent sown to summer months are excluded. Cotton is sown both under rainfed and irrigated conditions and in one and the same district both the types of crops are grown in different seasons as in the Masipattam and Western areas of this State. The trade varieties grown are Cambodia, Salems, Tinnevellies, Westerns, White and Red Northerns, Cocanadas, Warangal and Chinnapathi. In general, with the exception of a few, most of the types belong to medium to long stapled group. M U. 1 or otherwise known as 'Rajapalayam' is the best quality cotton grown in the State which is adjudged suitable to spin 44 warp counts and has a staple length of 1 to 1-1/16 of an inch. The survey of the manurial experiments conducted on "All India Basis" has shown that manuring in Madras State could be safely done both to irrigation and unirrigated cotton crops, with the exception of the unirrigated cotton in Bellary, Anantapur, Cuddapah and parts of Kurnool Districts. All most all the irrigated cotton crops of the State are at present grown under wells and spring channels. With the completion of Tungabhadra and Lower Bhavani Projects about one lakh of acres are expected to be covered by irrigated long stapled Cambodia cotton. In eight out of twenty-four districts, cotton is grown over a negligible area. They are Chingleput, Chittoor, North Arcot, Tanjore, Malabar, South Kanara, West Godavari and Krisha Districts. Cotton is often grown mixed with crops like groundnuts and cereals like korra, arika, ragi in districts like Bellary, Anantapur, Kurnool, Guntur and South Arcot. The area of cotton in such mixture depends upon the extent to which the main crops are sown and the period of rainfall, availability of water in the wells in the case of irrigated crops etc.

The items of Cotton Extension included in the first year's programme and started in June 1950 were (a) area increase through replacement of other crops (b) mixed cropping with groudnuts, chillies, ragi etc. and (c) application of fertilizers and (d) distribution of improved seeds. During the second and third years, other items like reclamation of waste land, double cropping, plant protection measures and improved

cultivation methods are also included in the programme. While preparing the targets, care was taken to see that the food position of the State was not weakened. The programme of rediversion from food crops to cotton was kept at a safe minimum during the first two years and greater emphasis was laid on mixed cropping and intensive cultivation methods. During the third year, the idea of diversion of areas from food crops was completely given up and efforts are being made to increase the production solely by intensive cultivation methods and mixed cropping to the extent feasible. The targets fixed for the various items of extension are given in table I appended for the three years 1950–'51, 1951–'52' and 1952–'53 and Table II gives the achievements for the first two years (data still incomplete for 1951—'52.)

It is seen, that the targets could not be achieved, in full, in both the years. The reasons are as follows:

1. In the first year, the scheme was started only late in June 1950 and sufficient time was not left for making intense propaganda, to procure cotton seeds and distribute the same in the taluks. Large areas of groundnuts were already sown and it was not possible to interplant cotton in the standing groundnut crop due to insufficient moisture in the soil and failure of further rains.

2. Seasonal conditions were extremely unfavourable in both the years due to complete failure of rains for the fourth and fifth year in succession, in many parts of the State. As such, large areas could not be sown to crops and in many areas even the sown crops were wiped out in large bloks in the case of rainfed crops and in the case of irrigated crops large areas were abandoned due to short supply of water in the wells and channels. The smaller cultivators abandoned their lands in large numbers to seek their food in famine relief centres, bigger towns, mines etc. Cattle tresspass also became a serious problem in many places.

3. During 1952, seeds could not be procured in sufficient quantities on account of (a) low yield of cotton crops in 1951, due to failure of rains in the places where seed multiplication schemes were run (b) inadequate premia conceded to Cambodia–2, Karunganni–2 and Karunganni 5 cotttons grown under seedfarm conditions during the peak marketing stages of the crop (c) purchase of seed farm kapas by local licensed dealers at rates considerably above the parity prices for lint, for purposes of adulterating, at a time when there was considerable scramble for the procurement of cotton (d) transport difficulties due to supply of waggons and (e) non-availability of good mungari seeds.

4. Tractors in working condition and in required numbers were not available for reclamation of fallows in many places.

5. Funds sanctioned under Takkavi loans were not readily available with the Collectors for the release of the money for the purchase of seeds and manures.

6. In the non-cotton growing areas adequate marketing facilities were not readily available for the sale of cotton and for getting fair prices they had to move the produce to long distances.

7. Due to cut in power supply and coal shortage the progress of work in the gins and mills were impeded to a certain extent.

8. In the case of chilli-cotton mixture in the Cocanada area, many cultivators were either not aware of the State legislation enforced to grow cotton in chilli crop or by the time they were informed, chilli planting was already over. Moreover, the price of chillies quoted at Rs. 16/- per maund in May-June 1952 suddenly shot up to Rs. 40/- in July and cotton lost its parity with the more remunerative commercial crops.

For implementing the targets the following measures were adopted:

1. Propaganda was intensified during the second year on all items of extension work, by holding meetings in the villages and addressing the cultivators in the regional languages; periodical radio talks were arranged; lantern slides were prepared and distributed to the various districts; leaflets on various topics were printed and distributed. Letters and notes were obtained from the cultivators regarding their impressions and experiences of the various recommendations included in the Cotton Extension Plan and the same were published in the Departmental Journals, in the various regional languages.

2. Improved seeds were procured to the tune of 34,554 maunds in 1950 – '51 and 51,903 maunds were procured in 1951 – '52. The same were distributed to the extent of 28,738 and 42,082 maunds respectively in the two years.

3. As per the information supplied by the tender firms and co-operative Societies, 1,198 tons of Ammonium Sulphate were distributed in 1950 – '51 and during 1951 – '52 (information incomplete) the quantity supplied was 822 tons.

4. Seeds of indigo were supplied at subsidized rates to cover the targetted area of 2,000 acres in Tirunelveli and Ramanathapuram districts for mixing with irungu cholam and to counteract the harmful effect of the fodder cholam crop on the succeeding cotton crop.

5. Under the Plant Protection Scheme, sanctioned separately by this State, pesticides were offered at subsidised rates during 1951 – '52 for protecting the Cambodia cotton over an area of 18,000 acres. To prevent blackarm attack in Cambodia cotton, seeds were recommended to be treated with Agrosan before sowing.

6. For the purposes of intercropping of cotton with groundnuts, ragi and chillies, 4,000 maunds of P. 216F from Punjab, 2,500 maunds of H. 420 from Madhya Pradesh and 400 maunds of Laxmi from Bombay

were imported during 1951 and 2,000 maunds of P- 216F and 2,500 maunds of H. 420 in 1952. The former two are short duration type and come to harvest from 4 to 5 months from the date of planting. All the three types are far superior to local Mungari cotton in quality.

7. Under "Double cropping", a pilot scheme of 500 acres sanctioned separately by the State Government, was run during the summer of 1951 by cultivating P. 216F cotton in the rice fallows of Tanjore. The results showed a great promise. Acre yields varying from 400 to 1200 lbs. of seed cotton were realised and no harmful effect was noticed on the yield of the succeeding 'Kuruvai' paddy but in addition, about 6,000 pounds of green leaf was supplied by the cotton crop. Chemical investigations showed that the fertility of the soil was not lowered by growing cotton. For 1952 programme, 3,000 maunds of P. 216F seeds were specially imported from Punjab for covering an area of about 10,000 acres. The work of providing filter points, pump sets and electric installations were also taken up.

8. For answering the marketing difficulties of the cotton grown in the 'non-cotton growing' areas, agents were pooled at taluk centres and the premium attached to the varieties grown in the Cotton Control Orders were extended.

9. To assess the progress of the area increase, village surveys were undertaken by ascertaining the area in each village sown to cotton in the previous year and in 1951 and 1952.

10. Steps were taken to grant premium to approved varieties of seedfarm cotton. But this grant from the Government of India was received late and most of the seed farm growers had by that time parted with their produce to the private dealers.

11. Procurement of improved seed was further made possible by the institution of a special purchase scheme for Khadi by the State in the Karunganni zone during the middle of the ginning season of 1951 and for the order compelling the certification of all Madras Uganda – 1, to make it eligible for being sold at rates exceeding top ceilings fixed for Cambodia cotton.

12. To prevent the movement of Westerns seed outside the district for cattlefood and keep the price down a ban was imposed.

14. Under reclamation of waste lands, steps were taken to bring areas under cotton after tractor operation. A pilot scheme was run in Salem District in 1950 over an area of 100 acres by growing Karunganni – 5 cotton and supplying the cotton for the Khadi section of the Rural Welfare Department. The scheme was successful and the same was continued in 1952.

Although the targets could not be achieved in full, it is however gratifying to note that in spite of various bottlenecks an increase of 6·8 percent in area was registered in this State as per the recent Fourth Forecast Report of the Economic Adviser and Joint Secretary to Government of Madras. The area upto 28th January 1952 is estimated at 16·433 lakhs of acres as against 15·386 lakhs of acres estimated for the corresponding period of last year. This increase is partly attributed to Cotton Extension Work and partly to the attractive prices offered at the time of sowing for cotton.

Future proposals for increasing the production of cotton in the State under the Extension Plan: (a) *Supply of pure seeds of approved varieties:* One of the important bottlenecks that was experienced by many States of the Union, besides Madras, regarding the implementation of the targets in full, was the short supply of good seeds. In recent years the quality of seeds has in general deteriorated in all the States since all types of cotton are consumed and every grain of seed utilised both for cattlefood and sowing. As a result there is high percentage of impurity in the crop and both yield and quality have suffered. This important question of the supply of pure seed has recently been seriously considered by the Centre and steps are now being taken to supply the maximum quantity of pure and good seeds in all important crops. To answer this shortage of pure seeds and to cover vast areas with good seeds and obtain good yields, adoption of dibbling seeds has been suggested. In the case of cotton, since quality of lint besides yield is an important consideration, every step should be taken to see that an entire zone is covered by an approved quality cotton recommended for the tract, in order to improve the yield and maintain the quality of the standard cotton. Although there are a good number of seed multiplication schemes in this State and each catering to a particular tract, the entire areas have not been completely covered by the improved varieties. With the financial assistance granted by the State and by the Indian Central Cotton Committee, Bombay and by the enactment of the Cotton Control Bill into an Act for enforcing cultivation of improved varieties recommended by the Agricultural Department, it is hoped to cover the entire zone within a very short period by pure seeds of approved varieties. For example, it is proposed to develop a well defined zone for Madras Uganda – 1 in the Central and Southern Districts of the Madras State comprising Coimbatore, Salem, Mathurai, Tiruchirapally, South Arcot, Ramanathapuram and Tirunelveli Districts to the exclusion of all the other inferior Cambodia varieties grown at present in this zone. In this connection, the Certification Scheme at least 95% purity is insisted upon for eligibility and the crop is subject to inspection from the sowing to the harvest stage during the growing period and again at the time of ginning and marketing of lint. By the adoption of the above measures, both the quality of lint and purity of seed are safeguarded. Similar zones are

also being thought of for other improved types viz. Karunganni – 5, Westerns – 1, Cocanadas – 1, and 881F cottons. There are also possibilities of creating zones for the recently introduced P. 216F cotton from Punjab and H. 420 from Madhya Pradesh which are noted for their exceptional earliness in addition to quality and are becoming popular with the cultivators as a result of the Cotton Extension Work.

(b) *Improvement in ginning percent:* Since in the case of rainfed cottons yields cannot be pushed beyond a limit and as they are subject to vagaries of season and rainfall, maximization of yield of lint could only be in the direction of improvement of ginning percent without sacrificing the yield and quality. Compared to the other States, the unirrigated deshi cottons of Madras have in general lower ginning percent values. This improvement is a long range problem and suitable varieties will have to be either evolved or introduced.

(c) *Diversion of area from 'deshi' to American cotton:* Since American cottons in general have better quality than the deshi cottons and as there is a greater demand in the Indian Union for quality cottons, it is highly desirable that as much areas as possible is diverted from deshi to American cottons. This item of work is an important programme in the Cotton Extension Work in States like Punjab. In certain other States like Bombay, nearly one lakh of acres are grown to the popular Laxmi cottons under irrigated conditions and the quality cotton is kept outside price control. In the Madras State, out of a total area of 2·64 lakhs of acres under Cambodia cotton, about 96,500 acres are grown under unirrigated conditions. As a long term plan, with the materialising of the major irrigation works like Tungabhadra and Lower Bhavani Projects and increasing development of minor irrigation works like pump schemes, sinking wells etc. there is a great possibility of increasing the area in this State under irrigated Cambodia cottons where at present unirrigated deshi cottons are grown, by at least another two lakhs of acres. It is also gratifying to note that as a result of the extension work, Combodia cotton is of late becoming increasingly popular even under unirrigated conditions as is instanced by the great demand for Laxmi cotton seeds during this year in parts of Bellary, Anantapur, Cuddapah and Kurnool districts.

(d) *Other considerations:* With the reclamation of greater areas of waste lands by the aid of tractors; by granting loans on liberal terms in time for the purchase of seeds and to meet other cultivetion expenses; by creating a chain of co-operative organizations for marketing, supply of fertilizers etc.; by liberal grant of subsidy to seedfarm growers; by affording greater irrigation facilities and by sustained propaganda, It is hoped that the shortage of cotton in the States will be overcome very soon and the country at large will not only become self-sufficient with respect to her raw cotton but reduce her imports and save foreign exchange to a considerable extent.

TABLE I.

Cotton Extension Scheme — Madras.

(Targets fixed as additional area and production during 1950—'51, 1951—'52 and 1952—'53)

Items of Extension	1950—1951		1951—1952		1952—1953	
	Area in acres	Production in bales of lint	Area in acres	Production in bales of lint	Area in acres	Production in bales of lint
I. *By Extensive Cultivation:*						
(a) By reclamation of fallow land ..	..	..	4,700	600	4,700	600
(b) By replacement of food crops ..	1,00,000	37,500	1,94,050	74,240	..	..
(c) By replacement of other crops ..	..	..	45,000	8,750	45,000	8,750
(d) Double Cropping ..	..	..	14,350@	5,823	14,350@	5,823
II. *By Intensive Cultivation:*			**No Programme**			
(a) Irrigation ..	..	..	..	..	..	..
(b) Inter-cropping ..	5,00,000*	50,000	4,87,925*	48,873	4,50,000*	45,000
(c) Manuring (Application of Ammonium sulphate) ..	56,800	7,500	64,000	7,109	60,000	7,500
(d) Improved seeds ..	1,36,550	4,390	6,70,990	8,534	6,75,000	8,438
(e) Control of Pests and Diseases ..	..	..	18,000	1,500	18,000	1,500
(f) Improved cultivation methods ..	..	..	2,000	..	2,000	100
Grand Total I plus II ..	1,50,000	99,390	2,97,326	1,55,429	99,483	76,211

N. B. @ 1/3 the area is actually under cotton.

* 1/10 the area is actually under cotton.

II a, c, d, e, f do not contribute to area increase.

Totals give actual areas under cotton.

TABLE II.

Cotton Extension Scheme — Madras.

(Targets achieved as additional area and production during 1950—'51 and 1951—'52)

Items of Extension		1950—1951		1951—1952	
		Area in acres	Production in bales of lint	Area in acres	Production in bales of lint
I. *By Extensive Cultivation:*					
(a) By reclamation of fallow land	..	5,103	725	4,270	606
(b) By replacement of food crops	..	1,630	815	42,818	16,759
(c) By replacement of other crops	..	2,26,068	35,000	26,946	1,987
(d) Double Cropping	..	2,000@	500	5,823@	1,414
II. *By Intensive Cultivation:*					
			No Programme		
(a) Irrigation	..	..	..	..	..
(b) Inter-cropping	..	78,224*	3,747	1,38,426*	12,681
(c) Manuring (Application of Ammonium Sulphate)	..	14,250	1,269	13,000	6,256
(d) Improved Seed	..	1,01,420	5,304	1,63,790	8,107
(e) Control of Pests and Diseases	..	..	..	176	5
(f) Improved cultivation methods	..	..	..	2,049	..
Grand Total I plus II	..	2,42,625	47,360	88,882	47,815

N. B. @ 1/3 the area is actually under cotton.

* 1/10 the area is actually under cotton.

II a, c, d, e, f do not contribute to area increase.

Totals give actual areas under cotton.

Some Past Trends in Agricultural Production in the Andhra Districts and the Rest of Madras State

By

R. RATNAM, B. A.

Introduction: The Government of India have announced their decision to carve out a separate Andhra State from the existing districts of Madras State which includes a predominantly Telugu speaking population. The new State is expected to start functioning before long. In the present note the trends of acreage and the production of some of the important crops separately in respect of the prospective Andhra districts and the rest of Madras are presented.

The data discussed in the present note relate to a period of 30 years commencing from 1921—'22 and ending with 1950–'51. The area and production statistics dealt with in the note were gathered separately for every year from the "Season and Crop Report" issued by the Madras Government. Separate figures were gathered for each year for the Andhra districts and for the remaining districts in Madras State. Average annual acreage and production figures were then worked out for each of the five-year periods commencing from 1921–'22. These data are presented in a summarised form in the tables included in this note.

General classification of area: The land surface of the prospective Andhra districts is about 38·3 million acres leaving about 41·9 million acres for the rest of Madras. About 10 to 11 percent of the lands in the Andhra districts and 13 to 14 percent of those in the remaining districts are current fallows. Between 41 and 45 percent of the lands in the non-Andhra area are being cropped every year whereas only 32 to 36 percent are cropped in the Andhra districts. This is because the area under forests and the area of lands not available for cultivation are larger in the Andhra districts. Waste lands also occupy a larger percentage of area in the Andhra districts.

Land use: The extent of net cropped area in both the regions have shown fluctuations in the past. The largest area of about 14·7 million acres was cropped in the Andhra districts during the quinquennium ending 1930–'31 and the lowest area of 13·7 million

TABLE I.
Land Use.

		During the five years ending					
		1925—'26	1930—'31	1935—'36	1940—'41	1945—'46	1950—'51
	Andhra District						
1. Net cropped area in thousands of acres	..	13,992	14,753	14,668	13,963	13,729	13,773
2. Area irrigated by all sources — In thousands of acres	..	4,108	4,051	4,035	4,267	4,489	4,779
2. Area irrigated by all sources — As percentage of net cropped area	..	29	28	28	31	33	35
3. Area cropped more than once — In thousands of acres	..	1,828	1,883	2,018	2,083	2,230	2,054
3. Area cropped more than once — As percentage of net cropped area	..	13	13	14	15	16	15
4. Area under certain crops expressed as percentage of net cropped area :—							
Paddy	..	28·8	28·8	29·6	29·0	30·3	31·6
Millets	..	48·6	45·9	45·7	43·2	45·0	41·6
Sugarcane	..	0·4	0·4	0·4	0·4	0·4	0·7
Cotton	..	6·0	4·7	3·8	3·8	3·3	2·5
Groundnuts	..	4·7	9·5	10·0	14·1	12·9	13·8
Coconuts	..	0·4	0·5	0·5	0·6	0·6	0·6
Fruits and vegetables	..	1·7	1·5	1·8	1·8	1·8	2·0
Chillies	..	1·9	1·3	1·5	1·2	1·3	1·6
Tobacco	..	1·5	1·3	1·4	1·7	1·8	2·1
Total	..	94·0	93·9	94·7	95·8	97·4	96·5

TABLE I. *(Contd.)*

		During the five years ending					
		1925—'26	1930—'31	1935—'36	1940—'41	1945—'46	1950—'51
	Rest of Madras						
1. Net cropped area in thousands of acres ..		17,537	17,685	17,409	17,725	17,668	17,264
2. Area irrigated by all sources — In thousands of acres ..		4,665	4,366	4,523	4,464	4,752	4,883
As percentage of cropped area ..		26	25	26	25	27	28
3. Area cropped more than once — In thousands of acres ..		2,435	2,496	2,611	2,829	3,000	2,740
As percentage of net cropped area ..		14	14	15	16	17	16
4. Area under certain crop expressed as percentage of net cropped area :—							
Paddy ..		33·6	32·5	34·9	34·0	36·2	35·4
Millets ..		38·8	35·4	39·0	37·2	36·9	35·4
Sugarcane ..		0·3	0·3	0·3	0·4	0·4	0·7
Cotton ..		9·4	8·1	9·7	10·0	9·0	7·2
Groundnuts ..		6·9	10·5	8·3	10·8	10·7	12·4
Coconuts ..		2·7	2·8	2·8	2·9	3·0	3·1
Fruits and vegetables ..		2·2	2·3	2·6	2·6	2·8	3·3
Chillies ..		0·6	0·6	0·7	0·7	0·5	0·8
Tobacco ..		0·4	0·4	0·3	0·3	0·3	0·3
Total ..		94·9	92·9	98·6	98·9	99·8	98·6

acres during the five years ending 1945–'46. During the next five year period there has been an improvement in the extent of area cultivated. But in the non-Andhra region the largest and the smallest cropped areas have occurred during the five years ending 1935'–36 and 1950–'51 respectively. Though these fluctuations in the net cropped area have existed, the extent of areas cropped more than once has shown a steady increase in both regions during the thirty years under review except for the last quienquennium ending 1950–'51 in the non-Andhra districts where a decline of about one percent in the area cropped more than once has happened. This shows that lands are being more and more intensively cultivated which results in exhausting the soil quickly. Farmers should carefully replenish soil fertility by application of manures and fertilisers in adequate quantities. Indications are available that a diminution in acre yields is happening.

Irrigated lands are more extensively met with in the Andhra districts. Their extent has increased from 29 to 35 percent of the net cropped area in the Andhra districts and 25 to 28 percent in the rest of Madras during the thirty years under review. The percentage of area allotted to the more important crops is given in Table I. The extent of paddy lands has increased in both regions. In the Andhra districts, paddy areas occupy 29 to 32 percent of the lands under cultivation but in the rest of Madras they cover 33 to 36 percent. But larger millet areas (41 to 48 percent) are situated in Andhra districts than in the remaining portion of Madras State (35 to 39 percent). A general loss of areas under millets has occurred in both regions. This amounts to 7 percent in the Andhra districts but only to 3·4 percent in the rest of the State. Similarly cotton is fast loosing acreages in the Andhra districts but less slowly in the non-Andhra area. The increase in the acreage under groundnuts from 4·7 to 13·8 percent of the net cropped area in the Andhra districts and from 6·9 to 12·4 percent in the rest of Madras shows how this money crop has quickly caught the imagination of the ryots. Tobacco which was losing ground in the Andhra area during the thirties again pulled up but in the rest of Madras this crop has shown no recovery. There is a slow increase in the area under fruits and vegetables in both regions. Sugarcane too is improving in acreage but its sepread is faster in the non-Andhra area. The crops given in Table I account for over 90 percent of the cropped area in both regions. Generally speaking the pattern of land use is similar in both regions.

TABLE II.
Area Under Irrigation.

During the five years ending	From Government Canals			From Other Sources			Irrigated Area Under Paddy		Difference of columns 8 and 2 as a percentage of col. 2
	In acres	As percentage of total irrigated area	As percentage of net cropped	In acres	As percentage of total irrigated area	As percentage of net cropped area	In acres	As percentage of total irrigated area	
1	2	3	4	5	6	7	8	9	10
				Andhra Districts					
1925—'26	2,008,984	49	14	2,099,455	51	15	3,561,913	87	77
1930—'31	2,070,953	51	14	1,980,300	49	13	3,419,874	84	65
1935—'36	2,096,998	52	14	1,937,671	48	13	3,548,329	88	70
1940—'41	2,185,320	51	16	2,081,524	49	15	3,814,936	89	75
1945—'46	2,410,666	54	18	2,078,584	46	15	3,912,506	87	62
1950—'51	2,612,040	55	19	2,167,014	45	16	4,073,499	85	56
				Rest of Madras					
1925—'26	1,425,459	31	8	3,239,154	69	18	3,894,258	83	186
1930—'31	1,481,400	34	8	2,884,684	66	16	3,791,189	87	156
1935—'36	1,526,496	34	9	2,996,419	66	17	4,045,374	89	166
1940—'41	1,609,085	36	9	2,854,952	64	16	4,033,699	90	151
1945—'46	1,725,219	36	10	3,026,398	64	17	4,412,373	93	156
1950—'51	1,888,522	39	11	2,993,993	61	17	4,252,989	87	125

Irrigation: Table I shows that there is a steady increase in the net cropped are a receiving irrigation. Columns 2 and 6 of Table II contain the actual areas in each region receiving water from Government canals and from other sources separately. It will be seen from column 3 that a larger percentage of the lands in the Andhra districts receive supplies of water from Government canals. During the thirty years under review an extra area of 5 lakhs of acres in the Andhra area has received the benefit of irrigation through Government canals as against 4·6 lakhs in the rest of Madras. Expressed as percentage of the total cropped area in each zone, the additian is over 5 percent in the Telugu districts and 3 percent in the remaining area. What seems to have happened in the non-Andhra area is that lands which were previously fed by other water sources such as wells, tanks etc., are now being fed by Government canals. In the Telugu districts, however, shifts from other sources of irrigation are not perceptible. Between 83 and 90 percent of all the irrigated areas in the Andhra districts as well as the rest of Madras grow paddy (vide column 9 of Table II. There is thus a general increase in the total extent of paddy lands under irrigation in both areas. Reading together the figures in columns 5 and 8 to 10 of Table II, it may be inferred that the increase in the irrigated areas under paddy has been achieved by growing this crop only in the areas newly brought under irrigation by Government canals and that such new areas have not been used to any appreciable extent for growing other crops. Extension of the irrigated area under paddy has not however happened to any perceivable extent in areas commanded by other sources of irrigation such as wells, tanks etc.

TABLE III.

Area Under and Production of Paddy.

During the five years ending	Average annual area under paddy	Percentage of area under irrigation	Average annual production of paddy	Area required to produce one ton of paddy
	Acres		Tons	Acres
		Andhra Districts		
1925—'26	4,036,523	88	Not worked	
1930—'31	4,254,010	80	3,050,272	1·395
1935—'36	4,344,288	82	3,095,864	1·403
1940—'41	4,055,498	94	2,871,890	1·415
1945—'46	4,157,274	92	2,821,246	1·473
1950—'51	4,355,225	94	2,833,904	1·537

	Acres		Tons	Acres
		Rest of Madras		
1925—'26	5,896,458	68	Not worked	
1930—'31	5,751,876	66	3,996,074	1·518
1935—'36	6,076,486	67	4,243,996	1·432
1940—'41	6,025,194	67	4,101,788	1·469
1945—'46	6,391,944	74	4,282,184	1·493
1950—'51	6,110,618	70	3,625,496	1·686

Paddy Production: Table III contains the figures of the area under and production of paddy in the Andhra districts and the rest of Madras. The paddy acreage have shown a steady increase in both regions. The percentage of these areas receiving irrigation too has steadily increased from 88 to 94 percent in the Andhra area and 68 to 74 percent in the rest of Madras. Substantial areas under paddy in the non-Andhra area do not receive irrigation and are grown under rainfed conditions. For this reason the average acre yield for the non-Andhra area taken as a whole is less than in the Andhra Districts. But the most disquieting part of the extension of the paddy area is that the acre yields in both regions have shown a downward trend. While one ton of paddy was produced from 1·395 acres in the Andhra area during the five years ending 1930 – '31 as much as 1·537 acres were required during the last quinquennium. The area required to produce one ton of paddy in the non-Andhra area was 1·432 acres during the five years ending 1935 – '36 and 1·686 acres during the last quinquennium. Thus during the period under review about 10·2 percent more land in the Andhra area and about 13·6 percent in the rest of Madras are required to produce one ton of paddy than what was required two decades ago. Having regard to the fact that during this period the total extent of net cropped area has not substantially increased and more irrigation facilities have been provided, it would appear that the area cropped with paddy more than once has accounted for the increased acreages under paddy. This is also confirmed from the general increase in the area cropped more than once shown in Table I. This intensive cultivation seems to have depleted soil fertility over the last three decades and has completely set off the increase in acre yields sought to be obtained by distribution of improved seeds. It would have been something at least if the lower yields resulting from depletion in soil fertility had been balanced by the increased yields obtainable from improved seeds so that extra total production proportional to the extended acreages

could be realised. Even this has not occurred. Taking the quinquennium ending 1930 – '31 as the base, the index numbers during the quinquennium ending 1950 – '51 (a period of 25 years) is 102·3 percent for acreage and 92·9 for production in the Andhra districts. In the non-Andhra area the corresponding index numbers for the same period are 108·6 for area and 90·7 for production. This fall in acre yields cannot be viewed with equanimity and has to be arrested.

TABLE IV.
Area Under and Production of Sugarcane.

During the five years ending	Average annual area	Average annual production in terms of jaggery	Outturn of jaggery per acre
	Acres	Tons	Tons
	Andhra Districts		
1925—'26	61,963	1,80,220	3·662
1930—'31	52,807	1,59,842	3·025
1935—'36	59,702	1,81,800	3·045
1940—'41	60,013	1,77,640	2·954
1945—'46	62,337	1,67,732	2·733
1950—'51	96,706	2,41,700	2·500
	Rest of Madras		
1925—'26	51,865	1,35,400	2·610
1930—'31	48,821	1,24,265	2·546
1935—'36	56,923	1,52,812	2·684
1940—'41	63,033	1,73,446	2·752
1945—'46	79,096	2,23,546	2·826
1950—'51	1,23,157	3,26,340	2·649

Sugarcane: The increase in the area under sugarcane during the thirty years ending 1950 – '51 has been phenomenal in the non-Andhra area. Starting from a mere 52,000 acres in the first quinquennium the area has multiplied by over 2¼ times. In the Andhra districts the sugarcane area during the first quinquennium was more than in the rest of Madras by about 10,000 acres. Since then the acreage in the Andhra area seems to have declined slightly during the next 20 years. However during the last quinquennium there has been an increase by 57 percent. The area under sugarcane in the non-Andhra districts is now 33 percent more than in the Telugu districts. The outturn of jaggery (gur) per acre has shown some remarkable differences in the two regions. In the Andhra districts the yield of jaggery has steadily fallen from 3·7 tons to

2·5 tons per acre during the thirty years under review, — a fall of 31·7 percent or a little more than one percent per annum. But in the rest of Madras the acre yields show an improvement from 2·6 tons to 2·8 tons per acre during the 25 years ending 1945 – '46 or about 0·3 percent per annum. But in the next quinquennium it has again shown a drop though the acre yield is still higher than it was in the first quinquennium. Despite the fact that the acre yields were higher in the Andhra districts during the twenties as compared with the rest of Madras the acre yields of the latter region seem to have overtaken and even surpassed the yields in Andhra during the quinquennium ending 1945 – '46 and still retain that advantageous position. One of the reasons for these variations may be that the sugarcane lands of the Andhra area are getting depleted of their soil fertility by repeated cultivation of this crop in the same area without adequate manuring whereas in the rest of Madras the extension of cultivation of sugarcane has occurred in new lands found suitable for raising this crop. The drop in the acre yields in the non-Andhra area during the last quinquennium may perhaps be indicative of the fact that the old lands are showing signs of exhaustion and further extension of acreage is taking place in poor lands.

TABLE V.

Area Under and Production of Groundnuts.

During the five years ending	Average annual area	Average annual production	Area required to produce one ton
	Acres	Tons	Acres
	Andhras Districts		
1925—'26	6,58,427	3,17,972	2·070
1930—'31	1,397,048	7,07,712	1·974
1935—'36	1,478,569	6,98,058	2·117
1940—'41	1,970,688	9,48,052	2·079
1945—'46	1,767,202	7,15,644	2·469
1950—'51	1,901,399	7,64,858	2·485
	Rest of Madras		
1925—'26	1,216,760	5,59,948	2·175
1930—'31	1,852,063	8,57,354	2·160
1935—'36	1,443,512	6,52,484	2·214
1940—'41	1,920,173	8,46,976	2·267
1945—'46	1,889,110	8,05,388	2·346
1950—'51	2,142,740	8,50,764	2·519

Groundnuts: The phenomenal increase in the acreage under groundnuts in the Andhra districts as well as the rest of Madras has been achieved by diverting millet and cotton areas to groundnuts.

Three times the area is now under groundnuts in the Andhra districts as compared with what it was 30 years ago. In the rest of Madras only a seventy-seven percent increase in acreage has been registered. But the area required to produce one ton of groundnuts has been steadily increasing in both areas indicating soil exhaustion in the fields growing this crop as well. Taking the first quinquennium in table V as the base the index number of acreage in the Andhra districts in the last quinquennium is 288·7 and of total production 240·5. The corresponding figures for the rest of Madras are 176·2 and 153·0. These figures bring out the fact that the decreased acre yields have not brought the total production below that of the first quinquennium only because the expansion in area has been very rapid. It seems reasonable to assume that the extension of cultivation cannot go on without limit. When that limit is reached the overall production will register a fall as in the case of paddy. The decreasing acre yields should cause concern to all persons concerned.

TABLE VI.
Area Under and Production of Cotton.

During the five years ending	Average annual area	Average annual production of cotton lint	Area required to produce one bale of cotton lint
	Acres	Bales (392 lb.)	Acres
	Andhra Districts		
1925—'29	8,38,649	Not worked	
1930—'31	6,93,853	86,676	8·005
1935—'36	5,53,062	67,778	8·158
1940—'41	5,39,625	68,834	7·840
1945—'46	4,44,869	50,324	8·841
1950—'51	3,38,880	42,464	7·982
	Rest of Madras		
1925—'26	1,657,217	Not worked	
1925—'31	1,437,828	3,61,264	3·980
1935—'36	1,689,761	3,87,250	4·364
1940—'41	1,774,018	4,00,674	4·428
1945—'46	1,599,060	4,02,090	3·968
1950—'51	1,244,667	3,05,880	4·396

Cotton: During the quinquennium ending 1925 – '26, Andhra districts accounted for roughly a third of the area under cotton in the entire Madras State. But now, they account for only a fifth of the area. Since the southern districts are eminently suited for cotton cultivation, improved Karunganni and Cambodia strains are being grown there. As a result of the area required to produce one

bale of 393 lbs. of cotton lint is between 4 and 4·5 acres in the non-Andhra area whereas inferior desi types grown in the Andhra districts require as much as 8 acres to produce one bale of cotton. The increased profits accruing from groundnut cultivation has resulted in the reduction in the extent of area under cotton. The production of cotton now is only about 70 to 80 percent of the total production 30 years ago. The variation in yields shown in the last column of table VI does not seem to warrant any definite conclusions as regards the existence of any specific trends in acre yields.

Manure Problem: The decreasing acre yields of paddy and groundnuts over the entire State and of jaggery in the Andhra districts referred to in the previous pragraphs raises the question why this has not been arrested in the past. As in almost every tropical country, the manurial problem of this State is to replenish the Nitrogen removed from the soils by the crops every year. The annual off-take of Nitrogen amounts to over a lakh of tons in the Andhra districts and 1·8 lakhs of tons in the rest of Madras by paddy, sugarcane, and cotton alone, leaving out of account such crops as millets, tobacco, oilseeds etc. The bovine population of the Andhra districts may supply 96 lakhs of tons of Nitrogen per annum and that in the rest of Madras 121 lakhs tons. All the available manures such as farm-yard manure, green leaf and green manures, compost, oilcake etc., put to gether will be just enough to supply Nitrogen to paddy alone at about 45 lbs. of Nitrogen per acre. Besides this, there will be other crops requiring heavy manuring. The Economic and Statistical Adviser to the Government of Madras, who conducted a pilot survey in 150 villages of Chingleput district has pointed out that farm-yard manure which supplies by far the largest quantity of manures provide only 26 percent of the manure requirements of the district. He considers that this is true of other districts as well. It is therefore small wonder that our acre yields are falling at a rate which should cause concern to all in view of the general paucity in manure supplies. India used to import from abroad an average of about 440,000 tons of Ammonium sulphate every year. During the year 1950–'51 a quantity of 78,638 tons of this fertiliser was distributed in this State. The manure dosage for paddy recommended by the Madras Agricultural Department is the use of about 5,000 lbs. of green manures per acre to produce 30 lbs. of Nitrogen plus 75 lbs. of ammonium sulphate to supply 15 lbs. of Nitrogen. On this basis the 4·4 million acres of paddy in the Andhra area can absorb nearly 1·5 lakhs of tons of

Ammonium sulphate and the 6·1 millions acres of the rest of Madras another 2 lakhs of tons. The factory at Sindri is targetted to produce 1,000 tons per day, so that all our requirements of this fertiliser can be easily obtained. But Ammonium sulphate has to be used in combination with green manure in order to secure best results. It would therefore seem imperative to accelerate the spread of the green manure plants *Sesbania spesiosa* and *Glyricidia maculata* recommended by the Madras Agricultural Department. Their cultivation is very simple. The latter is a quick growing tree which can be grown in paddy field bunds and all other vacant spaces at intervals of about 1½ feet. It grows luxuriantly and the leaves can be lopped off several times and used to manure the adjoining paddy fields, thus saving the cost and labour on transport. The growing of *Sesbania* in the ridges of paddy fields along with the first paddy crop (*kuruvai*) and plouging them in for the second crop (*thaladi*) has been proved to yield 4,000 lbs. to 6,000 lbs. of green manure from an acre, which would supply the requirements of one acre of paddy. The Agricultural Research Station, Aduturai (Tanjore district) has evolved the following very simple and inexpensive solution to the manure problem in paddy lands which had defied paddy growers all these centuries. The Tanjore paddy grower used all the manures available with him for the first crop of paddy (*kuruvai*) with the result that the second crop (*thaladi*) was allowed to shift for itself and yielded less than 1,200 lbs. of paddy per acre. The cropping system evolved at Aduthurai is to use the margins of the first crop lands to grow *Sesbania speciosa*. For the second crop this green manure is used and some plants are left to seed. Those plants produce the seeds required for next sowings. A short duration cotton followed *thaladi* (the second crop paddy) and it received a dressing of one hundred weight of Ammonium sulphate per acre. The green matter left by the cotton plants supplemented, if necessary, by locally available green leaves provided the necessary manure for the first crop of paddy. Thus every field produced its requirements of green manure seeds without affecting the use of the land itself for growing a food or a commercial crop. Lack of adequate soil moisture in single crop wet lands has been usually adduced as one of the arguments against the growing of green manure crop during the off-season. The method of growing *Sesbania speciosa* recommended by the Agricultural Department has given a solution to this problem. Seeds are broadcast in the fields just before harvest of paddy. They grow with the available moisture supplemented by summer showers. An acre of *Sesbania speciosa* so grown would

provide the green manure requirements of 3 to 4 acres. Indeed the adaptability of this green manure to a wide range of conditions is so remarkable that it has caught the imagination of ryots, and with sustained propaganda by the Department, it is fast spreading. The manure problem of both the Andhra districts and the rest of Madras is so acute and so urgent that the spread of these green manure plants over the entire paddy lands in these areas seem to offer the only quick and lasting solution to arrest further soil exhaustion, which has been going on without interruption for the last many centuries and which, if allowed to continue further, might entail disastrous consequences for the economic well being of the population in the above regions.

Summary and Conclusion: Trends in acreage and production of some crops during the thirty years ending 1950 – '51 in the Andhra districts and the rest of Madras show that :–

1. The average net area cropped intensively in Andhra districts is 34 percent against 43 percent in the the rest of Madras.

2. Intensive cultivation without adequate manuring has resulted in acre yields of paddy and groundnuts in both regions and of sugarcane in the Andhra area alone declining resulting in an overall acreage reduction in yield in spite of the increase in the total area.

3. The phenomenal increase under groundnuts has been achieved at the cost of the acreage under cotton and millets.

4. The manurial asset for both the areas from the bovine population is limited. So also green leaf and oil cake which are just sufficient for the paddy crop or hardly enough to meet the requirements of 30 percent of all crops put together.

5. The quantity of Ammonium sulphate available from Sindri should therefore be fully utilised by using it in combination with green manures.

6. The spread of green manure plants like *Gliricidia* maculata and Sesbania speciosa is the only quick and lasting solution for the manure problem in the Andhra districts as well as the rest of the Madras State.

New and Old Rice

By

E. J. VERGHESE, M. Sc.

Rice forms the staple food of more than half the population of the world and presents problems that are peculiar to its use in the East only. Their solution is, therefore, of importanee from considerations of public health affecting as it does the food of over 90 millions of human beings.

It is well known that rice immediately after harvest does not mill and cook well. It is therefore generally stored for sometime before it is cooked and consumed. The ill effects of a diet of new rice is a common experience, the symptoms resembling essentially of poor digestion. New rice imbibes very little water and cooks to a lumpy and shapeless mass or to a paste, yielding a thick viscous gruel. When, however, such a rice is stored for some months, it gains all round improvement in quality. It cooks to a good fluffy consistency, is more palatable and is easily digested. Its milling quality also is improved.

To effect this improvement in quality, rice is stored in many ways. In Madras State rice is stored as paddy in receptables made of plaited straw: e. g. *pattarai, moodas*, split bamboo: e. g. *kalanjiam, gadi* or cotton stalks: e. g. *kagni* or *gummi*; containers made of mud and brick: e. g. *panai, kanjaras;* wooden receptacles e. g. *arah* or *pathazam;* and in underground pits, earthenware pots, gunny bags etc.

The changes that take place on storage of rice in these receptacles are not clearly understood. In fact no detailed investigations on quality changes on storage of rice have so far been undertaken. The chemical and physical causes underlying the improvement in quality are in most cases merely surmised or at best indicated on evidence. Earlier workers on this problem have obtained evidence centering round one or the other of the following types of changes:

i. Starch constitutes about 65% of the rice grain. The minute particles of starch uadergo certain physical alterations, consequent on the loss of moisture and drying that obtain during storage. Due to these changes usually known as changes in the colloidal system of starch, the stored grain is able to absorb more water and expand more on cooking.

ii. The rice grain contains certain sub-microscopic biochemical substances, known as enzymes, which have the power to convert starch to a liquid condition. It is claimed that freshly harvested rice cooks to a pasty mass because of these starch liquefying enzymes, which are then at their maximum activity. These are inactivated by storage so that the stored rice is able to cook without loss of form or shape. The rice grain also contains certain other enzymes capable of breaking down starch into less

complex compounds like dextrines and sugars. It is also reported that these enzymes continue to act on the raw starch of the grain during storage and effect a slow breakdown and this brings about improvement in quality.

Recent experiments conducted by the author at the laboratories of the Government Agricultural Chemist, Coimbatore, have thrown further light on this problem. The main findings from these experiments are summarised below:

(1) On storage, rice acquires a greater capacity for swelling and expanding when boiled with water and cooked for food, to the extent of 12·45% of its original swelling capacity. The rate of cooking and the extent of expansion on cooking are different for different rices, some rice varieties howing an initial expansibility which is even greater than that obtained on storage of others. This difference is independent of the duration of the crop. It was also found that rices which show greater capacity to swell generally sell at higher prices.

(2) Old rice yields on cooking a less viscid *kanjee* (rice water). This is also true of the chemical substance starch extracted from the whole rice with cold or boiling water. These changes have been traced to alterations in the chemical make up of the starch particle.

(3) Starch is made up chemically by the combination of varying units of a simple sugar known as glucose, As new rice becomes aged, the number of the constituent glucose units become greater, thereby making the starch chemically more complex so that increasing amounts of the starch are retained in the grain and only smaller amounts pass into the kanjee while cooking.

(4) Raw and hand pounded rice contains 0·3—0·4 percent of phosphorus which is lost to the extent of 11·0—49% on washing and cooking, the loss being less in the case of the stored grain. Cooked rice is therefore poor in phosphorus and considerable proportions of it are left behind in the kanjee. Further, during storage the phosphorus contained in the exterior of the grain diffuses to the interior layers and more of it is fixed on to the starch.

(5) The starch particles of rice vary in size from two to ten thousandth of a millimeter. These are also aggregated into bigger units. The big and small granules are arranged compactly into the rice kernel. During storage the starch particles become appreciably reduced in size and altered in shape. Further there are re-arrangements of the particles themselves so that the pattern in the old rice is substantially different from that existing in the new rice.

(6) In between the particles of starch as existing in the rice there exists minute cavities or intergranular capillaries. These become wider

on storage, so that old rice is able to imbibe more water and expand more on cooking.

The recent investigations have traced the changes in quality of rice to the changes in particles size and shape of starch.

A Note on Sorghum Nitidum, (Vahl) Pers

By

N. KRISHNASWAMY and V. S. RAMAN

(Cytogenetics Laboratory, Agricultural Research Institute, Coimbatore)

The purpose of this note is to supplement certain data wanting in the paper by Ayyangar and Ponnaiya (1941) which have led to some misreading of their paper. The statements by these authors that (p. 17) "The *Para-sorghums* are distinguished.....and the reduced number of chromosomes being 2n = 10 as against 2n = 20 in the latter"; the subsequent inclusion of *S. nitidum* in the list of species and with regard to the location (p. 21) "the species is found in the Western Ghats of South India at elevations of 1000 to 7000 ft." have led Garber (1950) to read that the authors found *S. nitidum* also to have 2n = 10 chromosomes and to state that "no other collector has reported this species from Western India" and "Unfortunately efforts to get a collection of *S. nitidum* from Western India have been unsuccessful". A communication from Sri. Ponnaiya showed that no counts of chromosome numbers of this species had been done. Fresh collections of the species from the same source and also another hill were done. The numbers determined showed that these species also had 2n = 20 agreeing with Garber's (1. c.) findings. The authors have given only the general characteristics as mentioned in Snowden (1936) for *Parasorghums* and distribution as in Gamble (1934), The specimens were originally collected by them near Coimbatore from the hills which form the Eastern spurs of the Western Ghats. The Madras Herbarium gives the distribution of the species as Coorg, Nilgiris. Coimbatore, Palni hills and Tinnevelly. Too much generalisation has thus unfortunately led to misreading of the authors' intentions. Our thanks are due to the Government Lecturing and Systematic Botanist for permitting us to consult the relevent herbarium sheets.

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Crop Reports

Gingelly 1952—'53—Intermediate condition Report: Sowings of late gingelly are reported to have commenced in the districts of South Arcot and North Arcot and completed in most districts of the State. The crop is reported to have been affected by inadequate rains in Salem District. The late gingelly crop has failed in parts of Ramanathapuram district due to inadequate rains received during the growth. The wholesale price of gingelly seed per maund of 82-2/7 lb. or 3,200 tolas as reported from important market centres on 31—1—1953 was Rs. 29—8—0 in Tiruchirapalli, Rs. 29—0—0 in Rajahmundry, Rs. 28—1—0 in Kakinada and Rs. 27—8—0 in Vizianagaram. Compared with the prices published in the corresponding period of last year, these prices reveal a decrease of 13 per cent in Tiruchirapalli and Kakinada and 12 per cent in Vizianagaram.

Forecast—Paddy—Third or Final Forecast report 1952—'53—Madras State. The total area sown with paddy in 1952—'53 in the Madras State is estimated at 9,993,000 acres as against the finally recorded area of 10,041,000 acres for the previous year, representing a decrease of 0·5 per cent. Compared with the final area of last year, an increase in area is estimated in the districts of Anantapur, Cuddapah, Nellore, Chingleput, South Arcot, Chittoor, North Arcot, Salem, Tiruchirapalli and South Kanara and a decrease in area in the other districts of the State except the Nilgiris district, where the area is estimated to be the same as in the previous year.

The yield per acre of the first or main, the second and third crops is expected to be below the normal in all the districts of the State due mainly to inadequate rains during the growing periods of the crop. The condition of the standing crop is reported to be not satisfactory in Rayachoti, Pulivendla and Jammalamadugu taluks of Cuddapah district, parts of Chittoor and Visakhapatnam districts due to inadequate supply of water. Drought conditions are reported to prevail in Dharapuram, Tirupur and Udamalpet taluks of Coimbatore district. Withering of crops is reported in parts of Madurai, Ramanathapuram and Tirunelveli districts. In Tanjore district, the cyclone in December 1952 adversely affected the crop in the flowering stage, but rains during that month generally proved beneficial to the paddy crop.

Attacks on paddy crops by insect pests and diseases have also been reported in parts of Nellore and Tanjore districts. The Seasonal Factor for the State as a whole works out to 80 per cent of the normal for the first and second crops and 71 per cent for the third crop as against 83 per cent, 73 per cent and 72 per cent respectively estimated for the final estimates of the previous year. On this basis, the total yield is estimated at 4,033,000 tons in terms of rice. Compared with the final estimate of yield of 4,117,000 tons for the previous year, this is a decrease of 2·0 per cent. The average wholesale price of paddy second sort, per Standard Maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from some important market centres on 31st January 1953, was Rs. 8—2—0 at Cuddalore Rs. 8—7—0 at Mangalore, Rs. 9—6—0 at Eluru and Masulipattan, Rs. 9—7—0 at Vijayawada and Nagapattinam and Rs. 9—9—0 at Vijayanagaram. Compared with the prices published in the corresponding report of the previous year (i. e. those which prevailed on 16th February 1952) the present prices reveal a decrease of 0·4 per cent at Vijayanagaram, 8·3 per cent at Mangalore and an increase of 10·5 per cent at Nagapattinam, 11·4 per cent at Masulipatnam, 12·6 per cent at Eluru and 14·9 per cent at Vijayawada.

(From Economic Adviser, Government of Madras)

Weather Review — For February 1953

RAINFALL DATA

Division	Station	Total rainfall for the month	Departure fromnormal in inches	Total since 1st January in inches	Division	Station	Total rainfall for the month	Departure fromnormal in inches	Total since 1st January in inches
Orissa & Circars	Gopalpur	0·2	—0·7	2·3	Central Contd.	Vellore	0·0	— 0·3	0·1
	Calingapatnam	0 0	—0·6	1·1		Gudiyatham*	0·0	— 0·2	0·0
	Visakhapatnam	0·0	—0·9	2·1		Salem	0·0	— 0·3	£
	Arakuvalley*	0·0	—0·2@	0·1		Coimbatore (A. M. O.)*	£	— 0·2	0·1
	Anakapalle*	0·0	—0·5	0·3		Coimbatore	0·1	— 0·3	0·2
	Samalkot*	0·0	—0·7	0·0		Tiruchirappalli	0·2	— 0·1	0·7
	Kakinada	0·0	—0·3	0·1					
	Maruteru*	0·0	—0·2	£	South	Nagapattinam	0·0	— 0·8	3·6
	Masulipatnam	0·0	—0·5	£		Aduturai*	0·5	— 0·3	1·7
	Guntur*	0·0	—0·1	0·0		Pattukottai*	3·1	+ 2·2	4·5
	Agrl. College, Bapatla*	0·0	—0·1	0·0		Mathurai	0·7	+ 0·2	0·8
						Pamban	1·1	+ 0·2	1·7
	Agrl. College, Farm, Bapatla*	0·0	X	0·0		Koilpatti*	0·2	— 1·2	0·3
						Palayamcottai	0·6	— 0·6	2·3
	Rentachintala	0·0	—0·5	0·1		Ambasamudram*	2·1	+ 0·1	3·6
Ceded Districts	Kurnool	0·0	—0·3	0·0	West Coast	Trivandrum	2·3	+ 1·5	2·7
	Nandyal*	0·0	—0·1	0·0		Fort Cochin	0·4	— 0·4	0·4
	Hagari*	0·0	—£	0·0		Kozhikode	0·8	+ 0·1	0·8
	Siruguppa*	0·0	—0·1	0·0		Pattambi*	0·3	— 0·5	0·3
	Bellary	0·0	—0·2	0·0		Taliparamba*	£	— 0·5	£
	Cuddapah	0·0	—0·1	0·0		Wynaad*	1·2	+ 0·2	2 0
	Kodur*	0·0	—0·1	0·1		Nileshwar*	0·1	— 0·1	0·1
	Anantapur	0·0	—0·3	0·0		Pillicode*	£	— 0·1	£
						Mangalore	0·0	— 0·2	0·0
Carnatic	Nellore	0·0	—0·2	0·1		Kankanady*	0·0	— 0·2	0.0
	Buchireddipalem*	0·0	—0·2	0·1	Mysore & Coorg	Chitaldrug	0·0	— 0·1	0·0
	Madras (Meenambakkam)	0·2	—0·2	1·4		Bangalore	0·2	— 0·1	0·2
						Mysore	0·1	— 0·1	0·1
						Mercara	0·0	— 0·2	0·0
	Tirurkuppam*	0·0	—0·6	0·3	Hills	Kodaikanal	2·3	+ 0·8	3·2
	Palur*	0·0	—0·4	0·8		Coonoor*	4·8	+ 1·9	10·5
	Tindivanam*	£	—0·3	0·5		Ootacamund*	0·7	— £	0·9
	Cuddalore	0·0	—0·9	1·4		Nanjanad*	1·0	— 0·1	1·1
Central	Arogyavaram (Chittoor dt.)	0·0	—0·2	0·1					

Note :—

1. * Meteorological Stations of the Madras Agricultural Department.
2. @ Average of eight years data for Arakuvalley is given as normal.
3. Average of ten years' data is taken as normal.
4. X The Farm was started only in 1951.
5. £ Rainfall 1 to 4 cents.

Weather Review for February, 1953.

A feeble cyclonic circulation existed over Ceylon and the Comorin area on 1—2—1953. On the same day another cyclonic circulation lay over Chota Nagpur and the adjoining parts, and moved to Assam and neighbour-hood on the following day. The feeble cyclonic circulation over the Comorin area moved away to the Maldives area on 3—2—1953. In the mean-while a shallow low appeared over Lower Sind, Kutch and Saurashtra area on the evening of 1—2 —1953, moved North East wards and lay over the Punjab (I) and the adjoining North-Rajastan on 4—2—1953 and became unimportant. An anticyclonic circulation lay over Orissa and the adjoining Bay of Bengal on 5—2—1953. This shifted southwards and showed signs of weakening on 7—2—1953. This was replaced by another anticyclonic circulation which lay over Madhya Pradesh and neighbourhood on 9—2—1953 and persisted over the Central parts of the country upto 20—2—1953. On 19—2—1953 a low pressure wave was moving westwards across Ceylon and the Comorin area. This moved away westwards across the South-East Arabian Sea on 21—2—1953. Under its influence fairly widespread thundershowers occurred in Malabar and locally in Tamil Nad from 21—2—1953 to 23—2—1953. The anticyclonic circulation reappeared over North Coastal Andhradesa and neighbourhood on 23—2—1953. A cyclonic circulation persisted over East Uttar-Pradesh and the adjoining parts on the last three days of the month. A series of seven Western Disturbances with their associated secondaries passed over the extreme North of the country during this month.

Except for a few light showers that were received in Tamil Nad and Malabar from 21—2—1953 to 23—2—1953 dry weather prevailed on all days over the Madras State.

Night temperatures were generally below normal over the region except during the period 19—2—1953 to 25—2—1953, when they were generally above normal. Ootacamund recorded 32° F on 10—2—1953.

The noteworthy rainfalls and the zonal rainfalls for the month have been furnished, hereunder :

Noteworthy Rainfalls for the Month.

S. No.	Date	Name of Place	Rainfall for the past 24 hours
1	21—2—1953	Pamban	1·1″
2	22—2—1953	Coonoor	2·6″
3	22—2—1953	Minicoy	1·6″
4	22—2—1953	Kallakurichi	1·1″

Zonal Rainfall for the Month.

S. No.	Name of Zone	Average for the month	Departure from normal	Remarks
1	Orissa and Circars	0·02″	—0·36″	Below normal
2	Ceded Districts	0·00″	—0·15″	,, ,,
3	Carnatic	0·03″	—0·40″	,, ,,
4	Central Districts	0·04″	—0·23″	,, ,,
5	South	1·04″	—0·03″	Just normal
6	West Coast	0·51″	—0·02″	,, ,,
7	Mysore and Coorg	0·08″	—0·13″	Below ,,
8	Hills	2·20″	+0·65″	Above normal

Agricultural Meteorology Section,
Lawley Road P. O., Coimbatore,
Dated : 9th March, 1953.

M. B. V. N., C. B. M. & M. V. J.

Departmental Notifications

GAZETTED SERVICE
Postings and Transfers

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Sri Balakrishnan, M. R.	Asst. Agrl., Chemist	Lecturer in Chemistry Agrl. College and Research Institute, Coimbatore
,, Sundaram, M.	Lecturer in Chemistry	Gazetted Asst. Lecturer in Chemistry, Coimbatore
,, Anantha Padmanabha Pillay, R.	D. A. O., (on leave)	D. A. O., Madurai
,, Annaswamy Iyer, A. K.	D. A. O., (on leave)	D. A. O., Cuddapah
,, Krishna Reddy, T.	D. A. O., Cuddapah	Asst. Marketing Officer, Cuddapah
,, Thomas, K. C.	F. M., Wynaad	D. A. O., Anakapalle
,, Venkatanarayana, G.	Oil Seeds Specialist and Vice Principal, Coimbatore	Principal Agrl. College and Research Institute, Bapatla
,, Seshadri, C. S.	Asst. O. S. S. Nucleus Seed Farm Scheme, Coimbatore	Oilseeds Specialist, Coimbatore
,, Varisai Muhammed,	Asst. in Oilseeds, Coimbatore	Asst. Oil Seeds Specialist, Coimbatore
,, Ramakrishnan, T. S.	Government Mycologist, Coimbatore	Vice Principal, Agrl. College and Research Institute, Coimbatore

SUBORDINATE SERVICE
Postings and Transfers

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Sri Ramalingam, V.	Fruit Asst. Aduturai,	Tamil Journal Asst. D. A's Office, Madras
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,, Krishna Menon, K. M.	Asst. Agrl. Chemist,	Asst. in Chemistry, Coimbatore
,, Harichandramurthy, L.	A. D., Patapatnam	A. D., Ichapuram
,, Bhukta, N. M.	A. D., Ichapuram	A. D., Patapatnam
,, Gopala Rao, B. V.	A. D., Kakinada	A. D., Srikakulam
,, Gajapathy, V.	F. M., Pattukottai	Spl. A. D., Cyclone Relief Scheme, Pattukottai

Name	From	To
Sri Narayana Iyer, N.	P. A., to D. A. O., Guindy	A. D., Chingleput
,, Arumugavel, M. R.	A. D., Chingleput	A. D., Tanjore
,, Muthukumarappa, S.	Spl. A. D., Sugarcane, Villupuram	Spl. A. D., (Sugarcane Pest), Karur
,, Ramarathnam, W. S.	Asst. Fertilizer Inspector, Madras	A. D., Gudiyatham
,, Sankaranarayanan, C. S.	F. M., Central Farm, Coimbatore	Addl. A. D., Shoranur
,, Subba Rao, V. V.	Asst. in Chemistry, Coimbatore	Asst. in Millets, Nandyal.
,, Koyamu, K.	Cocoanut Nursery Asst., Pattambi	Asst. in Oil Seeds, Chowghat
,, Ummerkutty, O. V.	Cocoanut Nursery, Nileshwar	Asst. in Oil Seeds, Badagara
,, Balasubramanian,	A. A. D., Shoranur	Cocoanut Nursery Asst., Pattambi
,, Tirumelswara Bhatt, N.	A. D., Mangalore	Cocoanut Nursery Asst., Nileshwar
,, Sankaranarayanan, R.	Meteorology Asst., Koilpatty	Statistical Asst. in Meteorology, Coimbatore
,, Bakthavathsalu, C. M.	Statistical-Asst. in Meteorology, Coimbatore	Fruit Asst. Banana R. S., Aduturai
,, Chacko, C. I.	F. M., Dt. Live Stock Farm, Thiruvazhamkunnu	A. D., Ponneri
,, Sankaranarayana, C.	A. D., Tirupattur	F. M., Pattukottai
,, Raja Rao, N. V.	Marketing Asst., Kakinada	Marketing Asst., (Civil Supplies), East Godavary District

Agricultural College and Research Institute Library, Coimbatore.

LIST OF ADDITIONS DURING THE MONTH OF JANUARY 1953.

1.	BAILEY (S. F.) and SMITH (L. M.)	Hand book of agricultural pest control. I Edn. 1951. Industry publications, Inc. New York.
2.	CHILEAN IODINE EDUCATIONAL BUREAU	Iodine and Plant life, Bibliography 1813 – 1949. I Edn. 1950. Chilean Iodine Educational Bureau.
3.	CLERC (L. P.)	Photography, theory and practice. II Edn. 1947. Pitman & Sons.
4.	COLLINGS (G. H.)	Commercial Fertilisers. IV Edn. 1950. Balkiston & Co.

5.	COWEN (J. W.)	Heterosis. I Edn. 1952. Iowa State College.
6.	CRANE (M. B.) and LAWRENCE (W. J. C.)	Genetics of Garden Plants. II Edn. 1952. Mcmillan & Co.
7.	CROCKER (William)	Growth of Plants. I Edn. 1948. Reinhold Publishing Co.
8.	GUNDERSEN (Alfred)	Families of Dicotyledons. I Edn. 1950. Chronica Botanica.
9.	HALL (A. D.)	The Soil. V Edn. 1945. John Murray & Co.
10.	HILL (A. F.)	Economic Botany. II Edn. McGraw Hill Book Co.
11.	INDIA AGRICULTURE and ANIMAL HUSBANDRY (BOARD of)	Proceedings of the 8th Meeting of Crops and Soils Wing of Board of Agriculture held at Patiala (1950).
12.	KAINS (M. G.) and McQUESTEN (L. M.)	Propagation of Plants. II Edn. Orange Judd Publishing Co.
13.	KOCHHAR (P. L.)	Text Book of Plant Physiology. I Edn. 1951. Atma Ram & Sons, Delhi.
14.	KRISHNASWAMY (V.S.) and VENKATARAMANA REDDI (T.)	Short Report on the Fodder, Milk Supply and Land Utilisation Problems of the State of Madras. 1952. Superintendent, Govt. Press, Madras.
15.	LILLY (V. G.) and BARNETT (H. L.)	Physiology of the Fungi. I Edn. 1952. McGraw Hill Book Co.
16.	NORMAN (A. G.) *Ed.*	Advances in Agronomy – Volume III. I Edn. 1951. Academic Press.
17.	OSBORN (A.) and BEGENAL (N. B.)	Pruning. I Edn. 1952. Ward, Lock & Co., Ltd.
18.	PATERSON (D. D.)	Statistical technique in agricultural research. I Edn. 1939. McGraw Hill Book Co.
19.	SHAW (B. T.) *Ed.*	Soil Physical Conditions and Plant Growth. I Edn. 1952. Academic Press.
20.	SHEPARD (H. H.)	Chemistry and action of insecticides. I Edn. 1951. McGraw Hill Book Co.
21.	SPENCER (D. A.)	Colour photography in practice. III Edn. 1952. Pitman & Sons.
22.	THIMANN (Kenneth V.)	Action of hormones in plants & invertebrates. I Edn. 1952. Academic Press.
23.	THOMPSON (Louis M.)	Soils and Soil fertility. I Edn. 1952. McGraw Hill Book Co.
24.	WAKSMAN (Solman A.)	Soil Microbiology. I Edn. 1953. John Wiley & Sons
25.	WILLIS (J. C.)	Birth and spread of Plants. I Edn. 1949. Chronica Botanica.

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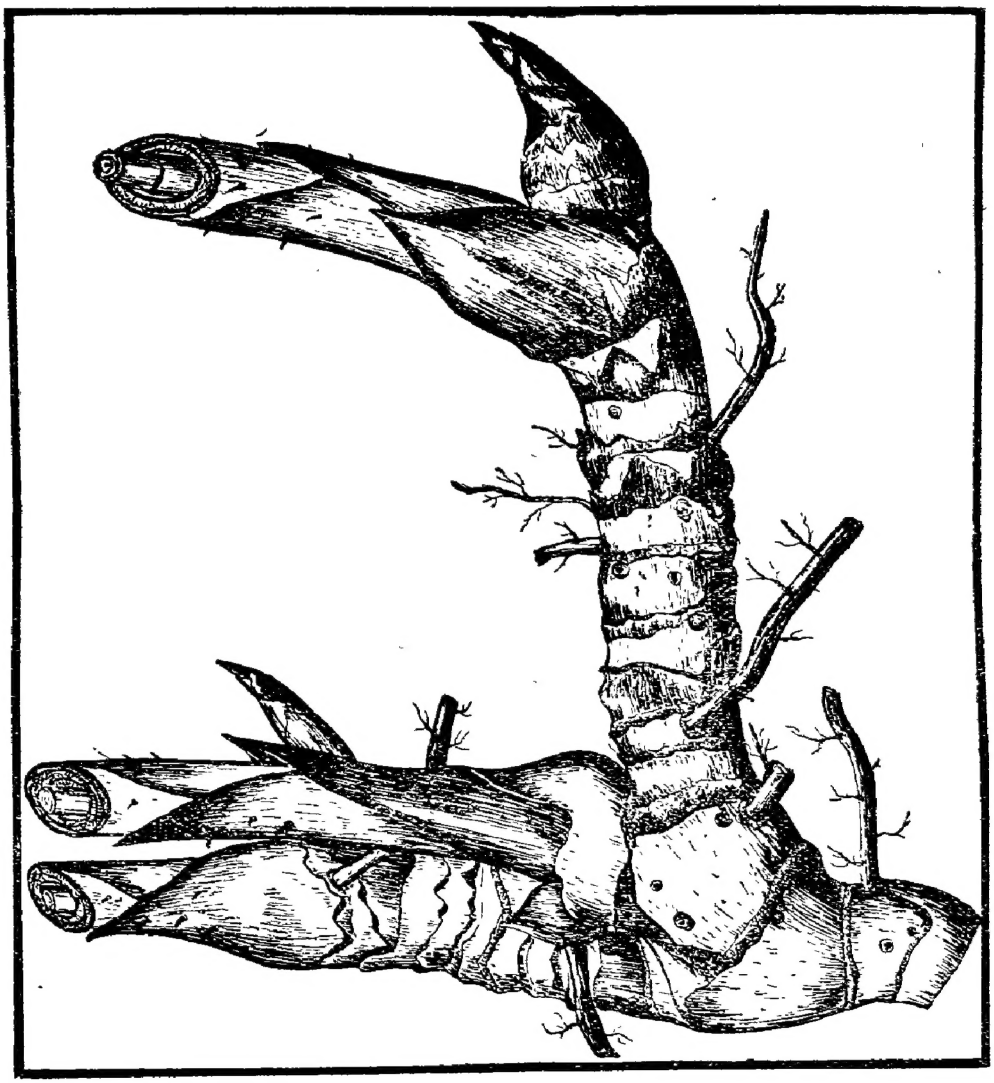
LIST OF ADDITIONS DURING THE MONTH OF FEBRUARY 1953.

1.	BALSTCON (J. N.) and TALBOT (B. E.)	Guide to filter paper and Cellulose powder Chromatography. I Edn. 1952. H. Reeve Angel & Co., Ltd., London.
2.	CLIFION (C.)	Introduction to the Bacteria. I Edn. 1950. Mc.Graw Hill Book Co.
3.	CLOKEY (Ira.W)	Flora of Charleston Mountains, Clark County Newda. I Edn. 1951. University of California Press.
4.	COMMONWEALTH AGRICULTURAL BUREAUX	Gazetteer of Agriculture and Forestry Research Stations in the British Commonwealth. I Edn. 1952. Commonwealth Agricultural Bureaux.
5.	DIXEY (FRANK)	Practical Hand book of water supply. II Edn. 1950. Thomas Murray & Co.
6.	HARROLD (L. L.) and DREIBELBIS (F. R.)	Agricultural Hydrology as evaluated by Monolith Lysimeters. I Edn. 1952. U. S. Dept. of Agric.
7.	JHONSTONE (Don) and CROSS (William P.)	Elements of applied Hydrology. I Edn. 1949. Ronald Press Co., Ltd.
8.	KRISHNASWAMY (G.V.)	Satatistics for Pass Students in Mathematics, Economics and commerce, I Edn. 1950. National Printers and Traders.
9.	Mc VICKAR (Malcolm H.)	Using commercial fertilisers. I Edn. 1952. Interstate Printers and Publishers.
10.	MEAD (DANIEL W.)	Hydrology. II Edn. 1950. McGraw Hill Book Co.
11.	NORMAN (A.G.) *Ed.*	Advances in Agronomy. Vol. IV. I Edn. 1952. Academic Press.
12.	SCOTLAND ROYAL HIGHLAND AGRICULTURAL SOCIETY	Transactions Vol. LXIII. 1951. Scotland Royal High land Agricultural Society.
13.	STANDLEY (Paul C) and STEYER Mark (Julian A)	Flora of Guatemala. I Edn. 1952. Chicago Natural History Museum.
14.	TOLMAN (C. F.)	Ground water. I Edn. 1937. McGraw Hill Book Co.
15.	TRUOG (Emil) Ed.	Mineral nutrition of Plants. I Edn. 1951. University of Wisconsin Press.
16.	WILSON (H. W.) & Co.	Agricultural Index. Vol. 12. Sep. 48 to Aug. 49. H. W. Wilson & Co.
17.	Ibid	Agricultural Index. Vol. 13. Sep. 49 to Aug. 50. H. W. Wilson & Co.

T. S. R.

Talinum Triangulare

To face P. 51. M. A. J. Vol. XL No. 2.



To face P. 61. M. A. J. Vol. XL No. 2.